

The
NATIONAL



A DICTIONARY OF UNIVERSAL KNOWLEDGE.

By

WRITERS OF EMINENCE IN

LITERATURE, SCIENCE, AND ART

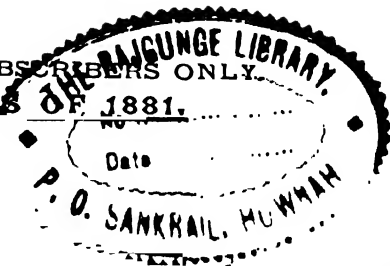
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THE

NATIONAL ENCYCLOPÆDIA:

A Dictionary of Universal Knowledge,

BY WRITERS OF EMINENCE IN

LITERATURE, SCIENCE, AND ART.

*Illustrated with about Six Hundred Page Engravings and Maps, many of them Beautifully Executed
in Colours, together with Several Hundred Woodcuts introduced in the Text.*

THE marked and ever-increasing signs of public favour bestowed on "THE NATIONAL ENCYCLOPÆDIA" have induced the Publisher to seize the present opportunity of preparing a New Edition, thoroughly revised and greatly enlarged, with the view of making it yet more worthy of the support so liberally bestowed on previous issues. The present time he considers peculiarly suitable for such an undertaking, as, in addition to the immense changes that have within the past decade affected almost every branch of science and of the arts, the valuable results of the Census of Great Britain, India, and the British Colonies, constitute a most important feature in such a work.

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every important article of merchandise, the Population, Revenue, Commerce and Shipping of every civilized country, as well as on other subjects which naturally occur in the course of his transactions.

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This cautious proceeding could not be long continued. The expensiveness of the wars in which the nation was engaged at the end of the seventeenth century made it necessary to incur debts beyond the means of their prompt redemption, and at the peace of Ryswick, in 1697, the debt amounted to £21,500,000. During the next ten years, although the country was again involved in a continental war, its amount was reduced to little more than £16,000,000, and the greatest efforts were made to raise money without imposing any lasting burden on the people. These efforts, indeed, soon found their limit, and at the accession of George I. in 1714, the debt had accumulated to the amount of £51,000,000, an amount which excited great uneasiness, and caused the House of Commons to declare itself under the necessity of making efforts for its reduction. In 1717 the debt amounted to £48,500,000, and the annual charge in respect of the same to £3,117,296. A great part of this debt consisted of annuities granted for ninety-nine years, the money obtained for which had varied from fifteen to sixteen years' purchase.

In 1736 the public debt of England amounted to about £50,000,000, but the annual charge had been reduced below £2,000,000. At the peace of Aix-la-Chapelle, in 1748, the national debt exceeded £78,000,000, but in the following year the public obtained some relief from the burden through the lowering of the rate of interest. At the breaking out of the Seven Years' War, in 1756, the debt still amounted to £75,000,000. A public writer of some repute, Mr. S. Hume, says, at that date, "It has been a generally received notion among political arithmeticians, that we may increase our debt to £100,000,000, but they acknowledge that it must then cease by the debtor becoming bankrupt."

When the Seven Years' War was ended by the peace of Paris, the debt reached £133,000,000, and the annual charge was £1,600,000. The war of American Independence raised the debt from £123,000,000 to £268,000,000, and the annual charge in respect of the same to £3,512,232. At the beginning of the war of the French Revolution the debt amounted to £200,000,000, and its annual charge to £2,437,862. But between 1793 and the peace of Amiens, the addition made to the capital of the debt amounted to £360,000,000, and the annual burden was increased from £2,437,862 to £12,515,624. Between the recommencement of the war in 1803, and its termination after the battle of Waterloo in 1815, there were added £120,000,000 to the capital of the debt, which then amounted, including the unfunded debt, to £885,000,000, and the annual charge upon the public exceeded £32,000,000. The debt has been created almost entirely by wars.

Since 1816 England's position has greatly improved as compared with other nations. In 1816 she owed £885,000,000 against £600,000,000, the united debt of all other countries; whilst in 1885 she owed £710,000,000, against nearly £5,000,000,000, the combined debts of other countries!

The progress in the reduction of the English debt will be better appreciated when it is remembered that the emancipation of slaves in our colonies in 1833 caused an increase in the debt of £20,000,000; the Irish Famine loan, a further £8,000,000; the Crimean War, about £35,000,000; the purchase of the Telegraphs, £10,000,000; and of the Suez Canal Shares in 1876, £3,300,000, making a total addition within recent years of £76,300,000. No special tax has ever been imposed for the reduction of the debt, which has been effected chiefly by sinking funds, terminable annuities, and the appropriation for the purpose of a certain portion of surplus revenue. In the six years from 1871 to 1876 the debt was in this way reduced by more than £25,500,000. The charge for interest, &c., of the national debt has been in recent years, and was in 1874, about £27,000,000. In 1875, however, a proposal of the

Chancellor of the Exchequer was adopted and became law, by which the regular charge for the national debt was fixed at £28,000,000 per annum, the portion of this in each year not actually required for interest being applied in reduction. An annually increasing sum is thus available for this purpose, the result being that the debt will be reduced in thirty years from 1875 by £162,000,000. If, in addition to this, the revenue is prosperous, and a certain portion of its annual surplus be devoted to reduction, the debt will be reduced in 1905 by £213,000,000.

The following table shows the total amount of the national debt of the United Kingdom at the end of each financial year, from 1871 to 1885:—

Financial Years ended 31st March	Capital of Unredeemed Debt.	Estimated Capital of Terminable Annuities.	Amount of Unfunded Debt.	Total Amount of National Debt.
	£	£	£	£
1871	732,043,270	51,050,196	6,091,000	789,184,466
1872	731,756,962	49,013,769	5,155,100	785,925,831
1873	727,374,082	47,018,928	4,829,100	779,222,110
1874	723,514,095	44,941,333	4,479,600	772,934,828
1875	714,797,715	43,988,742	5,233,300	768,019,757
1876	713,657,517	43,817,095	11,401,800	770,866,412
1877	712,621,353	43,449,568	13,913,800	770,014,723
1878	710,843,407	40,705,718	20,603,000	772,152,125
1879	709,430,593	37,664,369	23,870,100	770,964,062
1880	710,476,359	33,784,640	27,311,900	771,562,900
1881	709,078,526	34,988,435	22,077,500	766,144,461
1882	709,198,547	34,181,875	18,007,700	761,388,122
1883	712,694,994	27,570,876	14,185,400	754,451,270
1884	640,631,095	21,682,269	14,110,000	746,423,364
1885	610,181,896	86,115,658	11,013,100	717,309,654

* Under the National Debt Act, 1881, bonds amounting to £7,750,000 were converted into £8,000,000 stock.

† Including outstanding exchequer bonds issued for raising money for the purchase of Suez Canal shares. In 1885 these amounted to £3,439,340.

‡ Including £1,000,000 borrowed in aid of ways and means. In the course of the financial year 1883-84 £70,241,908 three per cent. stock was converted into terminable annuities under the provisions of the National Debt Act, 1883.

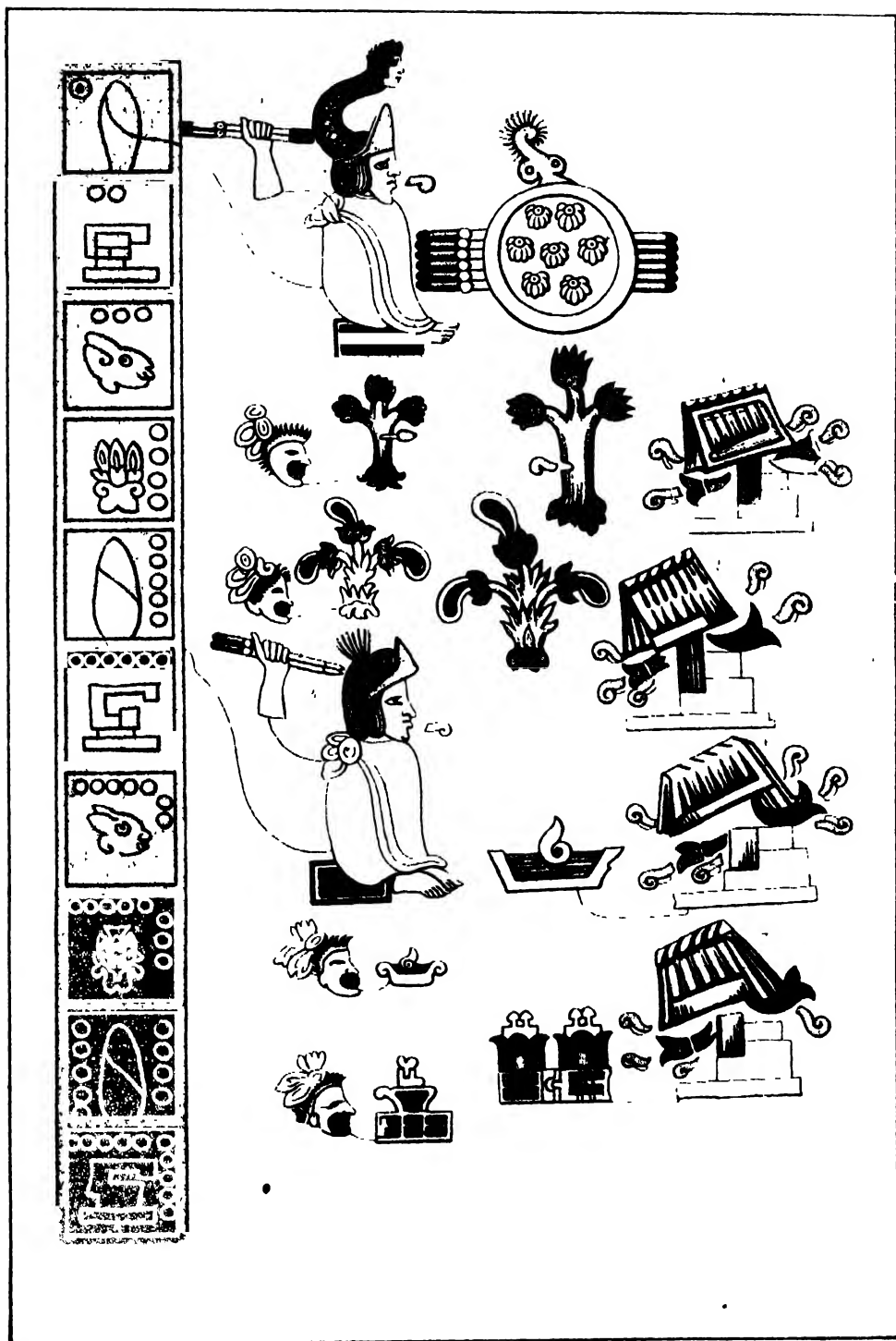
The public debt of the various nations of the world, according to the latest returns, will be found under the headings of the several countries; but it may be useful here to present a summary of the most important in Europe, according to the latest returns. France, of course, takes the lead, the war and indemnity having added about £160,000,000 to the debt since 1870:—

	£	£
Austria,	474,759,355	21,373,463
Belgium,	72,221,665	4,125,143
Denmark,	10,944,410	600,000
France,	900,000,000	47,000,000
German States,	297,466,406	13,348,180
Great Britain and Ireland,	740,330,654	28,000,000
Greece,	18,911,305	875,725
Holland,	78,442,470	2,706,000
Italy,	446,502,440	20,000,000
Luxembourg,	690,000	24,000
Montenegro,	170,000	8,500
Norway,	5,564,968	270,000
Portugal,	97,512,000	2,801,850
Roumania,	27,782,110	1,933,867
Russia,	683,000,000	28,440,922
Serbia,	5,500,000	310,000
Spain,	240,000,000	10,750,000
Sweden,	12,719,525	609,938
Switzerland,	1,340,000	77,894
Turkey, including Bulgaria and Eastern Roumelia, but not the Asian and African provinces,	149,687,434	12,237,599

Totals, 4,217,527,338 193,482,101

To show the entire indebtedness of the various nations of the world, we should add at least £800,000,000 for the United States, India, Australia, Canada, Cape Colony, Brazil, and other South American States, making the total

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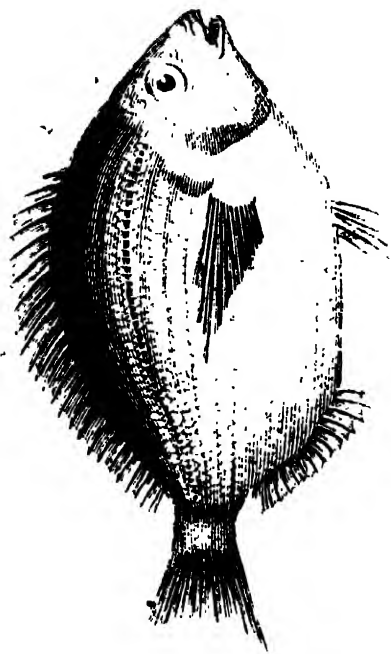
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Scorpaenopsis



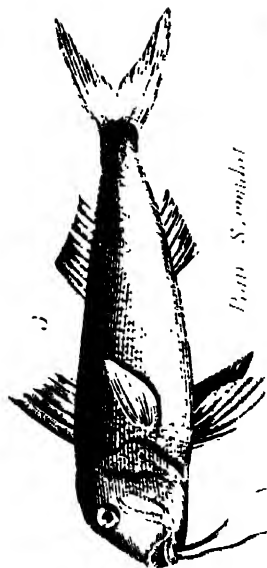
Scorpaenopsis



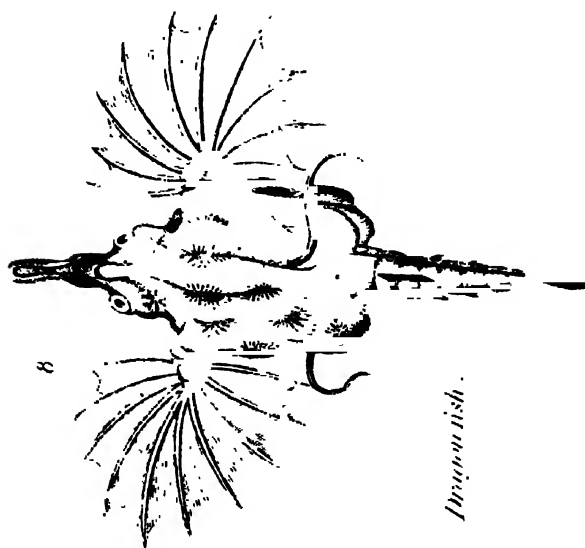
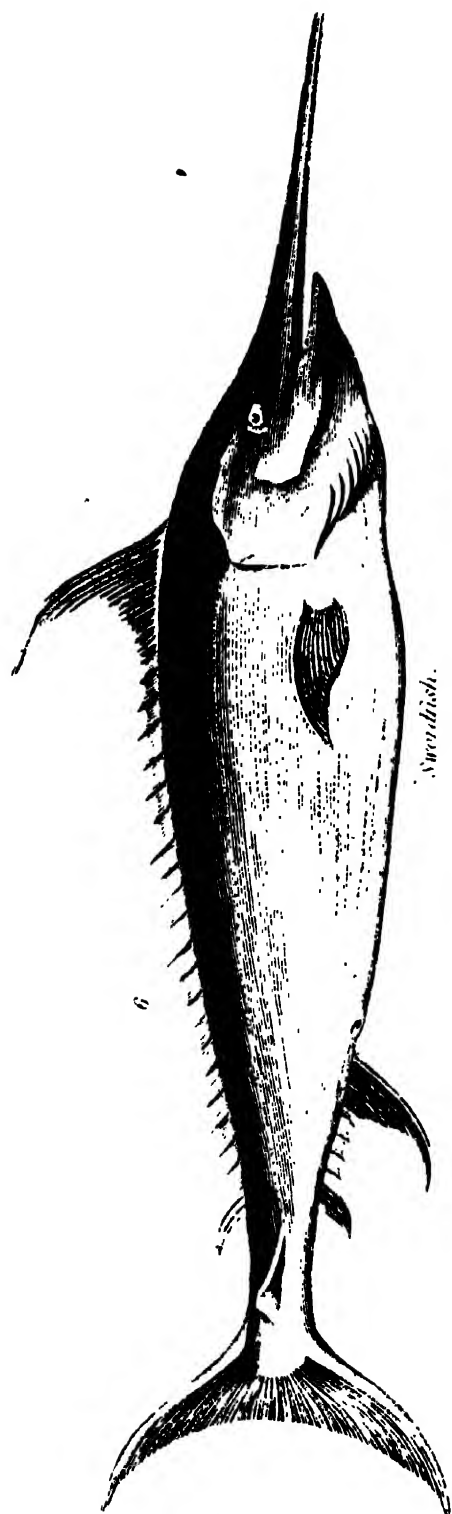
Urolophus

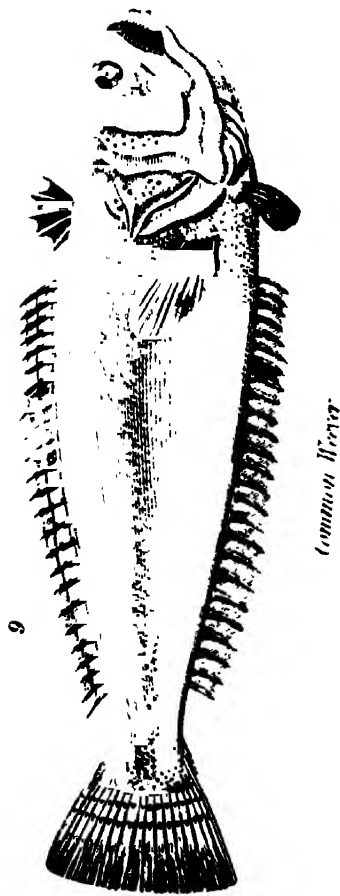


Scorpaenopsis

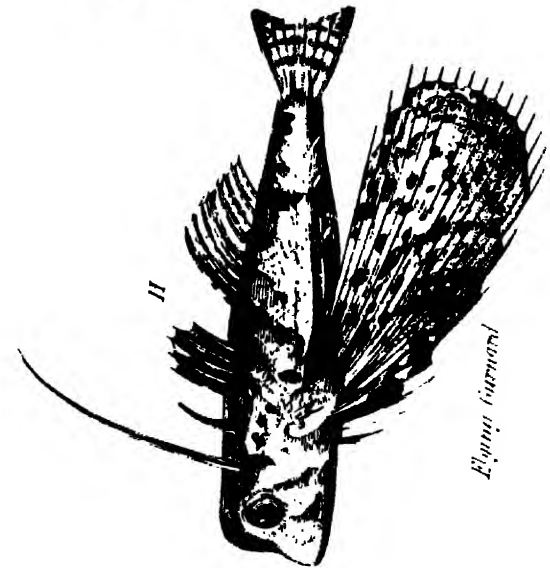


Scorpaenopsis





Common Noddy



Flying Gurnard



Common Goby



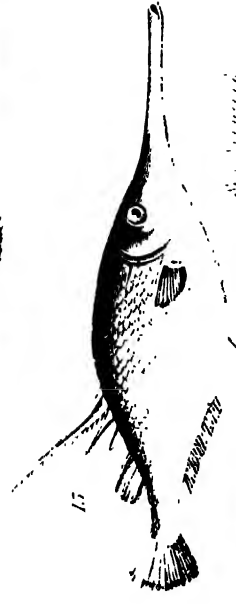
Alia maritima



Uchis naba



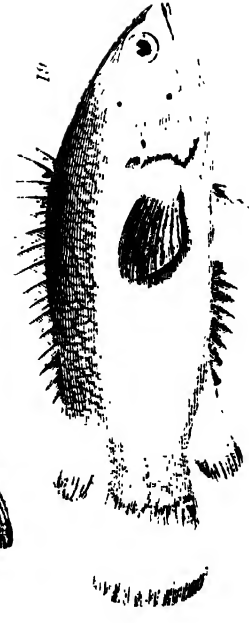
Gray Mullet



Twisted Snout-hound



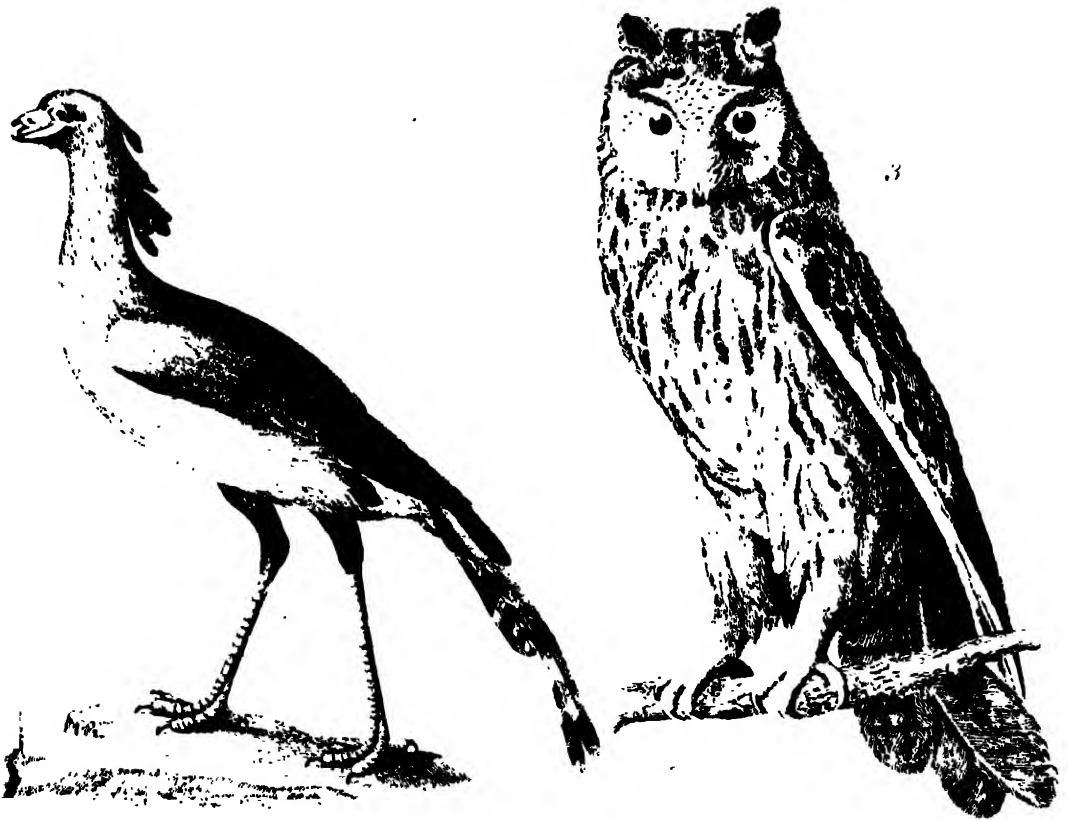
Crunch Sucker



Clam-bone Fish

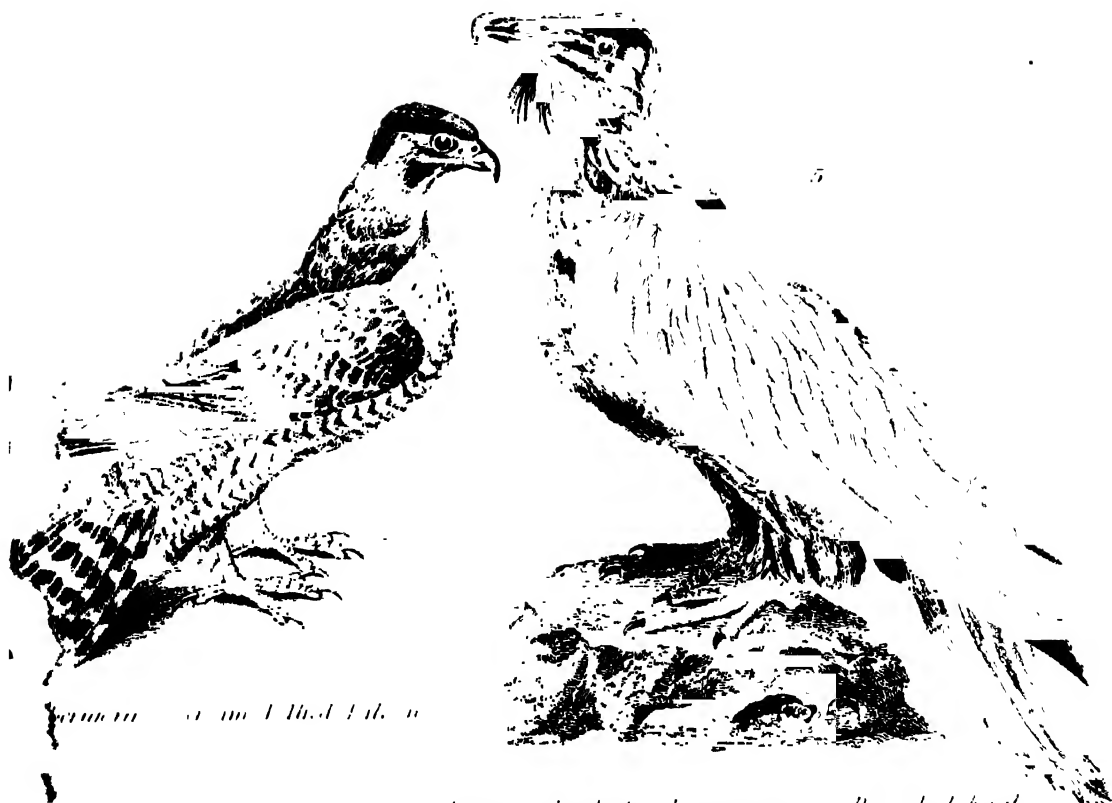


Buteo lagopus. Common Leaned Buzzard.



Serpentarius Secretarius. Secretary Bird.

Asio otus. Long Eared Owl.



Nyctaleus curvirostris Common Nighthawk

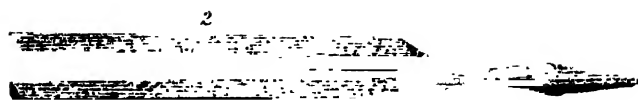
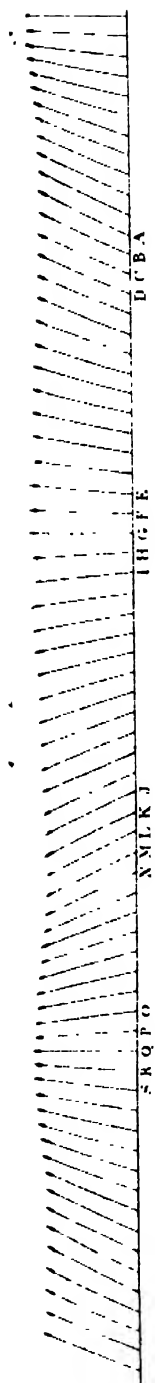
Buteo lineatus Barred Hawk



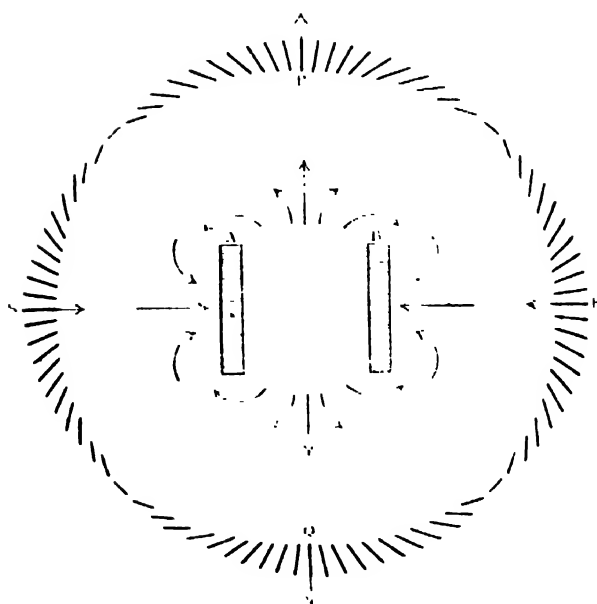
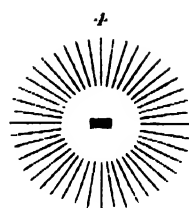
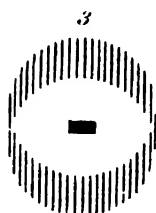
Strix nebulosa Spotted Owl

ACOUSTICS.

(FORM OF A SOUND WAVE)



Tuning Fork.



AUTINOZOA.

(ZOANTHARIA)

PLATE I



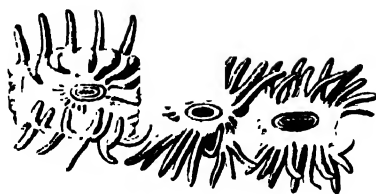
2 *Astraea* *lucida*



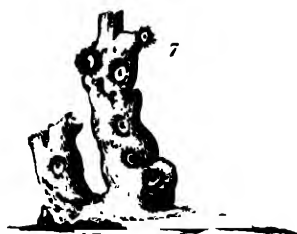
3 *Oculina* *littoralis*



4 *Verrucaria* *dentata*



5 *Meandrium* *littoralis*



7 *Oculina* *littoralis*



8 *Edwardsia* *Ellisi*



9-10 *Caryophyllia* *solitaria*



11 *Meandrium* *coralloides*

into all parts of the body without the interposition of tubes or vessels, and that which remains undigested is rejected through the mouth. They differ from certain other members of the sub-kingdom in having a space—the *perivisceral space*—intervening between the digestive cavity and the wall of the body, which space is divided into a number of compartments by walls. On these walls, or *mesenteries*, are placed the reproductive organs. When the eggs are hatched the young swim out through the mouth, and at first lead a roving life, moving by means of hair-like fibres, called *cilia*. These cilia are also often found in the body-cavity, circulating the nutritive fluid. There are no traces of a nervous system, but peculiar stinging organs occur, called “thread-cells,” which break on the slightest touch and project the fine long thread that has been coiled up in the cell. The mouth is fringed with feelers or “tentacles,” and can be withdrawn into the body.

There are two sub-classes, the ZOANTHARIA and ALCYONARIA. The Zoantharia have tentacles without fringes, and the parts of their bodies are in fives or sixes. [For figures see Plate I.] The Alcyonaria have eight fringed tentacles, and the parts of their bodies in fours. [For figures see Plate II.]

ACTION is a Roman term (*actio*), and signifies the legal process by which a man claims possession of some specific thing to which he has a right, or claims some use or profit in a thing, or requires another to do something which he has agreed to do, or to make pecuniary compensation for neglecting to perform his contract; or by which he claims pecuniary satisfaction for some illegal act of another to his person or property, and sometimes for negligence or omission to do certain acts.

Real actions are so called because they exclusively refer to real property, or things connected with land. They are brought for the recovery of lands or tenements, rents, advowsons, or other hereditaments.

Personal actions are those in which a man either claims the recovery of a debt, or some personal chattel, or satisfaction in damages for some injury to his person or property.

Mixed actions partake of the nature of real and personal actions, being brought for the recovery of lands, and also for damages—either for some injury done to the land, or some other wrong, such as the illegal detention of land from the proper owner.

The 3 and 4 Wm. IV. c. 27, abolished all real and mixed actions, except three real actions, and ejectment, which was a mixed action.

Personal actions are founded either on contracts or on torts (a term used to signify such wrongs as are distinguishable from breaches of contract), and these torts are usually considered as of three kinds—nonfeasance, or the omission of some act which a man is bound to do; misfeasance, or the improper performance of some act which he may lawfully do; malfeasance, or the commission of some act which is unlawful.

Actions are either local or transitory: local actions are founded on such causes of action as refer to some particular locality, as in the case of trespasses of land; transitory actions, on such causes of action as may be supposed to take place anywhere, as in the case of trespasses to goods, batteries, and the like. Real actions are in their nature local; personal actions are for the most part transitory. Local actions must be tried in the county where the cause of action arose, and by a jury of that county; transitory actions may be tried in any county, at the pleasure (in general) of the plaintiff. A plaintiff is not entitled to recover in respect of any damage that is too remote, or, in other words, flows not directly from an alleged wrong. In a case where the plaintiff, being a director of certain musical performances, brought an action

on the case against the defendant for publishing a libel on a public singer engaged by the plaintiff, alleging that she was thereby deterred from performing in public through the apprehension of being ill received, so that the plaintiff lost the profits which would otherwise have accrued to him as such director, it was held that the damage was too remote, and the action not maintainable.

The regular parts of an action at law are—1, the writ of summons, by which the defendant is compelled to appear; 2, the pleadings; 3, the trial and evidence; 4, the judgment; 5, the writ of error (where the judgment is supposed to be erroneous); 6, the execution.

Formerly legal proceedings were commenced in the common law courts by writ, and were known as “actions;” in the Chancery, Admiralty, and Probate Courts, by bill or information, by a cause in rem or in personam, or by citation respectively, and were known as “suits.” The Judicature Acts of 1873 and 1875, which assimilated the procedure of all the various courts, and merged them all in one “High Court of Justice,” with several divisions, also directed that proceedings should in future invariably be known as actions. And every action in the High Court must be commenced by a writ of summons, to be endorsed with a statement of the nature of the claim made, of the relief or remedy required in the action; and specifying also the division of the High Court to which it is intended that the action shall be assigned.

ACTIUM, a point of land at the mouth of the Sinus Ambracius, now forming the Gulf of Arta, which is memorable for the sea-fight which took place near it, in the Bay of Prevesa, between C. Julius Cæsar Octavianus, afterwards the Emperor Augustus, and Mark Antony, in B.C. 31. The former had 92,000 men and 260 ships of war, the latter 112,000 men and 220 ships, with an additional fleet of 62 vessels under Cleopatra, Queen of Egypt. Antony was completely defeated, and fled with Cleopatra into Egypt. The conqueror, to commemorate his victory, beautified the Temple of Apollo at Actium, instituted games after the Greek model, and erected Nicopolis, or the “city of victory,” on the northern side of the gulf, a few miles from the present city of Prevesa.

ACT OF GOD is a legal term, signifying any accidental or natural occurrence not the fault of human negligence or intervention, such as the consequences of storms, lightning, &c. No one is bound to make good to another such losses, unless by special contract.

ACT OF INDEMNITY. See INDEMNITY.

ACT OF PARLIAMENT. See PARLIAMENT.

ACT OF SETTLEMENT. See SETTLEMENT.

ACT OF TOLERATION. See TOLERATION.

ACT OF UNIFORMITY. See UNIFORMITY.

ACTON BURNEL, STATUTE OF. This statute was passed at Acton Burnel, in Shropshire, at a parliament held by Edward I. in the eleventh year of his reign, on his return from Wales. Acton Burnel was never even a market town, and Leland says (“Itin.” vii. 19) that the parliament was held in a great barn. The date of the statute is 12th October, 1283. It is a proof of the importance which the mercantile class had acquired—its object being to recover more quickly debts due to merchants and traders. Hence it is sometimes called the Statute of Merchants (*Statutum Mercatorum*). This statute enacted that a debtor’s chattels and devisable burgages might sold to pay his debts.

In a parliament held in the thirteenth year of his reign (1285) the king caused the statute of Acton Burnel to be rehearsed; and another *Statutum Mercatorum* (13 Ed. I. stat. 3) was passed which extended and gave additional facilities for enforcing the statute of Acton Burnel. Under this new statute all the debtor’s lands might be delivered to the merchant creditor, to hold till the debt was satisfied.

and the merchant had such a seisin of the lands delivered to him that he could maintain a writ of Novel Disseisin. The security which the merchant obtained under this act is called a Statute Merchant.

ACTON, JOSEPH, prime minister of the court of Naples, was the son of an Irish gentleman residing in France, and was born in 1737. He was originally in the French naval service, but subsequently obtained the command of a frigate from Leopold, duke of Tuscany. In an unsuccessful expedition against Algiers, in 1774, in which the government of Tuscany co-operated with that of Spain, Acton commanded the Tuscan vessels; and by his gallant conduct succeeded in saving three or four thousand Spanish soldiers, who must otherwise have perished. He was in consequence recommended to the service of the King of Naples, and was successively minister of the navy, of war, of finance, and ultimately became prime minister. In his policy he was constantly opposed to the French party in Italy. He died at Palermo on the 12th August, 1811.

ACTS OF SEDE RUNT (in the law of Scotland) are statutes made by the Lords of Session, by virtue of a Scottish Act of Parliament, passed in 1510, which empowers them to make such constitutions as they may think expedient for ordering the procedure and forms of administering justice. These are called Acts of *Sederunt*, because they are made by the Lords of Session sitting in judgment.

ACTS OF THE APOSTLES, the fifth book in order of the New Testament, called also by some early writers the Gospel of the Holy Ghost, or the Gospel of our Saviour's Resurrection. It forms a sequel to the third Gospel, and is divided into two distinct portions, the first extending from the dedication to the end of the 12th chapter, containing an account of the spread of Christianity in Palestine, chiefly through the work of the apostle Peter; and the second, which commences with the 13th chapter and continues to the end, giving an account of the ministry of the apostle Paul to the Gentiles. The time covered by the history comprises a period of about thirty-three years. Neither section, however, can be regarded as being a regular or complete history of the events of which it treats. In the first portion but little reference is made to the labours of any of the apostles, with the exception of Peter, and it gives no account of the church at Jerusalem after his imprisonment and deliverance. The second portion also omits many important events in the life of the apostle Paul which took place during the period over which the history extends. This may be seen by comparing the narrative with the accounts given by the apostle himself in the 1st and 2nd chapters of the Epistle to the Galatians, and the 11th chapter of the Second Epistle to the Corinthians, both of which epistles were certainly written before the journey of the apostle to Rome, with which the book of the Acts concludes. Events are also referred to by the apostle in other epistles of which no mention is made in the Acts. The book must rather be regarded as a series of memoirs, considered by the writer to be sufficient, with the Gospel he had written, to enlighten the mind of Theophilus and that of the church generally as to the first origin and subsequent spread of Christianity, the right of the Gentiles to admission into the church; and the ministry and work of the apostle Paul, of whom the author was friend and companion. As to the place where this book was written, and the date of its composition, nothing is certainly known. Antioch, Alexandria, Ephesus, Macedonia, and Rome have all been given as being the place of its composition, and dates suggested by critics vary from 63 to a very much later period. The canonical authority and authenticity of this book have been generally admitted from the earliest times, and are accepted by the leading Jewish scholars of the present day.

ACTUARY, a word which, properly speaking, might

mean any registrar of a public body, but which is generally used to signify the manager of a joint-stock company under a board of directors, particularly of an insurance company, whence it has come to stand generally for a person skilled in the doctrine of life annuities and insurances, who is in the habit of giving opinions upon cases of annuities, reversions, &c. Most of those called actuaries combine both the public and private part of the character.

The name has a legal character, from its being recognized in the statute 59 Geo. III. c. 128 (or the Friendly Societies Act of 1819), which enacts that no justice of the peace shall allow any tables, &c., to be adopted in any friendly society, unless the same shall have been approved of by "two persons at the least, known to be professional actuaries, or persons skilled in calculation"—a definition much too vague to be any sufficient guide. In the 10 Geo. IV. c. 56, however, no alteration was made in the law on this point; but by the 9 and 10 Vict. c. 27, the power is confined to the actuary of the National Debt Office, or an actuary of not less than five years' standing in some public insurance company. The registrar of the Lower House of Convocation is called the actuary.

There are two Societies of Actuaries in this country—"The Institute of Actuaries of Great Britain and Ireland," founded in 1818, and "The Faculty of Actuaries in Scotland," established in Edinburgh in 1856.

ADAGGIO, in music, a tempo or time indication—from the Italian *adagio*, at ease, leisurely. Adagio indicates the slowest time in general use, being slower than the *Andante*. To express still slower movements the words *Largo* and *Grave* are used. All three words are, however, somewhat interchangeable, the adagio being usually embellished with florid passages here and there, while the *largo* retains throughout a smoother, broader character, as its name implies (*largo*, broad), and the *grave* is invariably of a solemn and majestic character. This may be seen by comparing Beethoven's adagio in Sonata Op. 2, No. 1, with the *largo* in his Sonata Op. 2, No. 2, and with the *grave* Introduction to his Sonata Pathétique. *Adagietto* is used for a tempo somewhat less slow than adagio, or for a short adagio movement.

ADAL, a country between Abyssinia and the Red Sea, extending from the Massowah to the Gulf of Tadjurah. The coast line, which is about 300 miles in length, is of coral formation. The low tract along the side of the Red Sea is one of the hottest places on the globe. At one part of the coast is the isolated mountain of Gedom, about 5000 feet high; and there are numerous conical hills.

The interior of Adal is only known along the routes which European travellers have followed in ascending from the sea to the table-lands of Tigré and Shoa. These routes are from Massowah to Tigré, and from Tajurrah to Ankobar; there is also one from Amphilla Bay. In the former of these there is a gradual ascent of 8000 feet, from the lowlands of Adal to the highlands of Abyssinia, furrowed by ravines through which rivers flow. This was the route chosen by the British expedition of 1868—Amesley Bay being the landing-place and base of operations. Camels, mules, asses, goats, and sheep are abundant. This tract is the haunt of numerous wild animals; elephants and lions are sometimes met with.

The route just described is the usual one for reaching Abyssinia; but the southern one, from Tajurrah to Ankobar, is now recommended as being less steep. One remarkable feature is Bahr Assal, a salt lake sunk in a depression 570 feet below the level of the sea, and partly covered with a sheet of salt 6 inches thick. At one part are two lofty peaks, Mount Abida and Mount Aiyah or Azolo, rising to the height of about 4000 feet. They appear to stand in the centre of a volcanic tract, from which sheets of lava have descended on all sides to the

plain for 30 miles round. The country contains two great salt plains, which, besides furnishing the supply required for culinary purposes, also provide the natives of Abyssinia with a currency. The salt is for this purpose cut into pieces of the shape of a scythe whetstone, its value varying according to the distance to which it is taken.

Adal is inhabited by many tribes, which are comprehended under the name of Danakil or Dankali. They all appear to belong to the same stock, but their language differs entirely from that which is spoken in Tigré and Shoa. They lead a nomadic life, and are Mohammedans.

ADALIA, or **SATALIEH**, the ancient *Atolia*, a seaport of Asia Minor, on the Gulf of Adalia. Population, about 8000. It is the chief seaport on the south coast of Asia Minor, but its harbour, in which fleets once rode, is almost deserted.

ADAM, the name given in the Old Testament to the first man and father of the human race. The word is of uncertain etymology, and is supposed to be derived either from a root signifying red, or from the word *adamah*, the ground.

Two narratives of the creation of Adam and Eve are given in the Book of Genesis, the first in chapter i. 26-30, and the second in chapter ii. 7-25. The first of these records is termed the Elohist, from the fact that in speaking of God the name of Elohim is used; and the second the Jehovist—*the terms used there being Jehovah or Jehovah Elohim.* The story of the temptation and fall, contained in the third and fourth chapters, are also Jehovist. There are various theories held concerning these narratives, the three principal of which are—1, That of literal interpretation, in which the stories are accepted as actual history; 2, The allegorical theory, in which they are regarded as being of the nature of parables; and, 3, The mythical or traditional. The first theory has been largely held by both Jews and Christians; and in the Calvinistic system of theology Adam is regarded as the covenant head or federal representative of the human race, who are thus involved in the consequences of his transgression. The second theory has also had many supporters, including Philo, Clement, Origen, and Ambrose in patristic times, and Coleridge and Donaldson in recent years; while the third theory—namely, that which ascribes a mythical or traditional origin to the narrative—is that which obtains the most general acceptance among modern scholars.

The later Jewish traditions embodied in the Talmud contain many extravagant stories of the creation and life of Adam and Eve, and the Mohammedans have also many fantastic legends relating to the same subjects.

ADAMANT, a word no longer employed as a scientific term, but used chiefly as a poetical expression synonymous with diamond, or as descriptive of some other extremely hard substance. The word is derived from the Greek *Ἀδάμαντ* (*adamas*), in the genitive *Ἀδάμαντος* (*adamantos*), the meaning of which is properly "unconquerable." The word was used to denote the hardest metal with which the Greeks were acquainted, probably steel. It was also applied to the diamond, and to a compound of gold and steel.

ADAMANTINE SPAR. See CORUNDUM.

ADAMAWA, formerly called Fumbina, a country of Central Africa, lying between Lake Chad and the Bight of Biafra. Its length from north-west to south-east is about 200 miles, and its width 80 miles. Large tracts of arable and pasture land occur, also numerous hills and mountains, the loftiest of which is the isolated peak of Mount Alantika, 9000 feet in height. The two principal rivers are the Faro and the Benue, both of which are subject to an extraordinary overflow at the end of September. Elephants and crocodiles abound, and the rhinoceros and other wild animals are met with. *Yolla*, the capital, is

situated in 9° 28' N. lat., and 12° 13' E. lon., between the two rivers just mentioned, in a rich plain. It covers a large area, and extends 3 miles from east to west, owing to the practice of surrounding the huts with court-yards, in which grain is cultivated. The population numbers 12,000. Cotton—the usual medium of barter—cotton-cloth, salt, and beads form the principal articles of trade. The country was overrun by the Fulbe, a Mohammedan race, but not entirely subjugated by them. The ruler is a Mohammedan, who is subject to the nominal jurisdiction of the Sultan of Sokoto.

AD'AMITES or **ADAMIANs**, a fanatical sect of the second century, whose chief tenet was a desire to revert to the supposed days of innocence, before the fall of Adam, and who therefore agreed to deny themselves all sensual pleasures. They rejected marriage, and went about naked; but, as might have been expected, speedily became very confused in their moral ideas, and were guilty of even greater licentiousness than that against which they had originally protested. A somewhat similar sect arose in Bohemia and Moravia in the fifteenth century, who were known as "the Brethren of the Free Spirit;" but one of their fanaticisms was that they declared for a community of wives and for the abolition of the priesthood.

ADAM, ROBERT, born at Kinkeddy, in Fifeshire, according to some authorities, and, according to others, at Edinburgh, in the year 1728. He received his literary education at the University of Edinburgh; and derived instruction in the principles and practice of his future profession from his father. When he was in his twenty-sixth year he went to Italy, where he remained several years. During his stay he went to Spalatro in Dalmatia, to measure and delineate the ruins of the palace of Diocletian, and shortly after his return to England, in 1762, he published, in a large folio volume, engraved representations and descriptions, with attempted restorations, of the palace. About the same time, 1763-64, he was appointed architect to the king. In the course of a few years he designed, and in conjunction with his brother James executed a great many public and private buildings in England and in Scotland, including Caen Wood House, Middlesex; Luton House, Bedfordshire; the screen to the Admiralty Office, London; the Register Office, Edinburgh; Shelburne House, now Lansdowne House, Berkeley Square, London; the parish church of Mistley, in Essex; and some others. The Messrs. Adam also designed an infirmary at Glasgow, and some extensive new buildings in the University of Edinburgh, though their practice, after the year 1780, was principally in London, Portland Place, Stratford Place, and Hamilton Place, the south and east sides of Fitzroy Square, and the buildings of the Adelphi, are the most extensive of these works (Adam Street, Adelphi, still bears his name). Mr. R. Adam continued to be actively engaged in business down to the period of his death, which took place in March, 1792. He was buried in Westminster Abbey, in the south transept of which is a tablet to his memory.

ADAM'S BRIDGE, a name given to a series of sandbanks, islands, and rocks lying between India and the island of Ceylon. The distance from shore to shore is about 69 miles, and there are only two navigable channels in it. One, called the Mannar Passage, which separates the island of Mannar from the coast of Ceylon, in one part has not more than 4 feet of water at flood-tide. The other, called the Paumban Passage, separates the mainland from the island of Rammiseram. The Paumban Passage is very narrow, and has from 11 to 12 feet at low water. The space between Mannar and Rammiseram, which is about 30 miles wide, is occupied by a bank of sand covered only at high water. In 1862 a committee of the House of Commons considered the question of forming a navigation channel, by cutting a canal through the island of Rammis

serum, but the evidence was not sufficient to sustain the proposal.

ADAMS, JOHN, a distinguished American statesman, was born in the town of Braintree, near Boston, in Massachusetts, on the 19th October, 1735, of a family which had come from England at the first settlement of the colony. Having received his education at Harvard College, he was called to the bar, and soon obtained extensive practice. In 1765, when the first serious discontent of the people of America was excited by the Stamp Act, Mr. Adams took an active part in those measures of constitutional opposition which eventually forced the repeal of that obnoxious statute. He continued, during the remaining first years of the struggle, to exert himself conspicuously in the front rank of the friends and supporters of the colonial cause. In 1774 he was elected one of the four representatives from the province of Massachusetts Bay to the general Congress, which, among other proceedings, entered into a resolution to suspend the importation of British goods; and he was also a member of the second assembly of the same nature, held some time after, which took measures to enrol the people in an armed national militia. It had already become evident to many that the contest with Great Britain must finally be decided by the sword; and Adams seems to have been one of the first who adopted this conviction. He was accordingly one of the chief promoters of the Declaration of Independence, passed on the 4th July, 1776. In 1780 he was sent by the United States as their ambassador to Holland; from which country, about the end of 1782, he proceeded to France to co-operate with Dr. Franklin and his brother commissioners in the negotiations for peace with the mother country. In 1785 he was appointed the first ambassador from the United States to Great Britain; and he had his first audience with his Majesty in that character on the 2nd of June. He remained in England till October, 1787. In 1789, when Washington was elected president of the Union, Mr. Adams was elected vice-president, and he was re-elected to the same office in 1793. In 1797, on the retirement of Washington, he was chosen president; but he failed to be re-elected on the expiration of his first term of four years, his competitor, Mr. Jefferson, who had also been opposed to him on the former occasion, having a majority of one vote. The general tone of the policy of Adams had been opposed to that of the democratic party, which was represented by Jefferson. The rest of his life was spent in retirement. For some years before his death his health had become extremely feeble, and at last little more remained of the once active and eloquent statesman than the mere breath of life. He was in this state when the morning arrived of the 4th of July, 1826—the fiftieth anniversary of the Declaration of Independence. Awakened from sleep by the ringing of bells and other rejoicings of that grand jubilee, the venerable patriot was asked if he knew the meaning of what he heard. "Oh, yes," he replied, the glow of old times seeming to return to him for a moment; "it is the glorious 4th of July!—God bless it!—God bless you all!" Some time after he said, "It is a great and glorious day"—adding, after a pause apparently of deep thought, "Jefferson yet survives." These were the last words he was heard to utter. At six in the evening he expired. The same day also terminated the career of Jefferson, his fellow-labourer in laying the foundation of the independence of their common country, and afterwards a successful rival.

ADAMS, JOHN QUINCY, son of the preceding, was born at Braintree, Massachusetts, on the 11th July, 1767. In his eleventh year he accompanied his father to war, where he gained a thorough command of the French language. He returned to America in 1779, and in 1781, at the age of fifteen, went as private secretary with Mr.

Dana, the American envoy, to St. Petersburg. He afterwards visited Holland, London, and Paris, and returned to America in 1785, where he took his degree of A.M., at Harvard College, in 1788, and began to practise as a barrister, and to write for the press. In 1794 he was appointed by Washington ambassador to the Hague. He returned to America in his father's presidency, and was sent by him to Berlin, where he succeeded in negotiating a commercial treaty with Prussia. When Jefferson became president, in 1801, he was recalled, and in the following year was elected member of the Senate of Massachusetts, and in 1803 member of the Senate of the United States. From 1806-9 he was professor of rhetoric in Harvard College. In 1810 he was sent as ambassador to Russia, and in 1814 he was intrusted, in company with Russell and Clay, with the negotiations for peace with England, which resulted in a treaty, signed 21st December, 1814. He was then appointed ambassador to London. On his return home, in 1817, he was appointed secretary of state under Monroe, and in 1825 was elected president. He failed to secure re-election, but continued a member of Congress until his death, which took place 23rd February, 1848. During the latter period of his life he rendered good service to the movement for the abolition of slavery. He was the author of numerous works which had a fair reputation at the time, but are now generally forgotten.

ADAM'S PEAK, called *Hanulelil* by the natives, is a very high point of the island of Ceylon, and the centre of the mountain ranges in which the largest river of that island, the Mahawelli-ganga, takes its rise. It is situated about 6° 50' N. lat., 80° 35' E. lon., and 15 miles E.S.E. of Colombo, conical in form, and 7470 feet in height. The principal materials of which the mountain is composed are gneiss and granite. Thick forests clothe the lower part of it, which is very steep and difficult of access. On the summit is a hollow in the shape of a human foot, about 5 feet in length by 2 broad. The Mohammedans assert that it was caused by Adam standing here and doing penance after his expulsion from Paradise; while the Hindoos explain that the impression was made by Buddha in stepping across to Siam, or previous to his ascent into heaven. Others regard it as the footprint of the god Siva. A wooden temple has been erected over it, and a priest receives the offerings of the numerous devotees who resort here. The path which leads to it is the work of pilgrims. (See Illustration on p. 53.)

ADA'NA, capital of the province of the same name, in Asia Minor. Its ancient name was *Antiochia ad Sarum*. It is about 30 miles from the sea, and occupies a position of importance as a key to the Taurus Mountains, in Northern Syria. During the war with Egypt the Turks lost possession of it, but it was restored to them in 1840. The river Silun (*Sarus*), on which it is situated, is here crossed by a splendid bridge of fifteen arches, attributed to Justinian. The town is well supplied with water, and contains numerous fountains. Its population is 20,000. The heat in summer is intense, but in the winter the climate is mild and salubrious. The province, which is very fertile, produces corn, wine, wool, and fruit, which are largely exported.

ADANSONIA (*digitata*), so called in honour of Michael Adanson, the naturalist, is an extraordinary tree found in Africa within the tropics, particularly in Senegal, where it is called *Baobab*.

The celebrated traveller Humboldt considered it as the "oldest organic monument of our planet," in consequence of the calculations of Adanson that specimens, still found on the north-west coast of Africa, are probably 5000 years old; these calculations are, however, open to many objections. Adansonia is unlike any other known tree: the

enormous dimensions of its trunk bear a striking disproportion to the other parts; it is not unusual to find a trunk not more than 12 or 15 feet from the root to the branches, with a circumference of 75 or 78 feet. The ordinary height of the tree is from 40 to 70 feet. Another species, *Adansonia Gregorii*, is found in Australia. The lower branches are very long, and at first horizontal, extending perhaps 60 feet, the consequence of which is that they bend down to the ground, entirely hiding the trunk, and giving the tree the appearance of a huge mass of verdure. The wood is very soft, even when in perfection, and is subject to the attacks of a fungus, which renders its enormous bulk liable to be overthrown and dismembered by the least storm. A curious practice prevails among the negroes of hollowing its trunk out into chambers, and therein depositing the bodies of malefactors, or of persons to whom the usual rites of sepulture are denied. In this situation the bodies become dried up, and soon acquire the state of perfect mummies. The fibre of the bark is made into rope and cloth, and is so strong as to give rise to the

proverb, "As secure as an elephant bound with a baobab rope."

Adansonia belongs to the natural order MALVACEÆ, sub-order Bombaceæ, among which it is at once known by a broad tube of stamens and deciduous calyx, combined with a woody-closed fruit, containing a soft pulp.

ADANSON, MICHAEL, a French naturalist of high reputation, was born at Aix, in Provence, 7th April, 1727. He was of Scotch extraction, but his family had become exiles in consequence of the troubles that distracted Scotland in the early part of the eighteenth century. At a very early age he was placed at the University of Paris, under the care of the celebrated Réaumur and of Bernard de Jussieu. He was destined for the church, but a feeling that his pursuits, and perhaps his temper, were but ill-adapted to the duties of the priesthood, induced him to resolve upon seeking some other employment, in case his slender patrimony should prove insufficient for his wants.

An opportunity having occurred of visiting Africa, in 1748 he embarked for Senegal, being then twenty-one.



Adam's Peak, Ceylon.

Five years were spent by him in this colony, during which time he succeeded in forming considerable collections in every branch of natural history. He returned to Paris in 1753, rich in knowledge, but impoverished in worldly means. His "*Natural History of Senegal*," published four years afterwards, is a mass of original views and of valuable practical information. Among other things, it contains the first attempt upon record of classifying shells according to the animals they contain, instead of their external forms alone. The opinions which Adanson had early held of the insufficiency of the classification in natural history at that time received in Europe, had become confirmed by his discoveries in Africa. He perceived that the sexual system of Linnaeus was founded upon incomplete and partial views. To the method of Tournefort the objections appeared fewer, and accordingly he determined to attempt a classification of his own, of which that of Tournefort might serve as the basis. This appeared in 1763, in two volumes 8vo, under the name of "*Families of Plants*." Unfortunately for its author, his views were more advanced than those of his contemporaries. He also attempted to introduce a barbarous nomenclature, which, it must be confessed, was at variance

with common sense; and, what was worse than all, he unceremoniously rejected that system of Linnaus which had become the basis of the botanical creed of almost all Europe. For these reasons, notwithstanding the high character of Adanson's "*Families of Plants*," they have had scarcely any circulation beyond France; and when, in 1789, the "*Genera Plantarum*" of Jussieu made their appearance, the utility of his work generally ceased.

The Revolution overwhelmed him in the ruin it brought for a time upon his country, and he fell into so lamentable a state of destitution that when, upon the establishment of the Institute of France some years after, he was invited to become one of the earliest members, he was obliged to refuse the invitation to attend "because he had no shoes." In his latter days he enjoyed a small pension from the French government; but his constitution was broken by the calamities he had undergone; a complication of maladies tormented him, a softening of the bones confined him to his bed, and he died on the 3rd August, 1806, in the seventy-ninth year of his age.

ADAPTATION is a word used in zoology and botany to express the changes which living beings undergo, owing to variations in their environment or conditions of life.

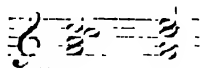
ADAR, the twelfth month of the Hebrew year, corresponding to the latter part of February and the beginning of March. In the modern Jewish calendar it is the sixth month of the year.

ADDA, the Roman *Addua*, a river of Lombardy, rises in the Rhaetian Alps, near Bormio; passing through the Valteline, it enters the Lake of Como, from the south-eastern branch of which it issues below Lecco; it then crosses the plain of Lombardy, and falls into the Po about 8 miles above Cremona. Its general course is to the S.W., and its length about 150 miles. It was formerly the boundary between the territory of the Venetian republic and the duchy of Milan. It is a wide and rapid stream, affording a good military position in advance of Milan on the east. The battle of Lodi was fought on its banks in 1796, when the Austrians were defeated by Napoleon.

ADDA. See SKINK.

ADDAK, an antelope inhabiting the deserts around Nubia. It is a large powerful animal, about 3 feet in height at the shoulder. The horns, which are about 36 inches long, are narrow and spirally twisted. The fur of the body is of a grayish-white tint; that of the head and neck, a reddish-brown; the mane is well developed.

ADDED SIXTH, CHORD OF THE, in music. The old name for the second inversion of the chord of the eleventh on the dominant. It has the appearance of the common chord on the subdominant with an *added sixth*, whence its name. We give an example in the key of C, with the most natural (not by any means the only) resolution. See DISCORDS.



Added Sixth. Resolution.

ADDER (*Colas beryus*, or Viper, is the only British poisonous snake. It is the *igga* of Aristotle, the *vipera* of Virgil (Georg. iii. 417) and Pliny, and the *naedes* of the Anglo-Saxons. The adder belongs to the sub-order Solenophen, poisonous snakes with a dilatable mouth, and the fangs in the upper jaw perforated. The poison, although not generally fatal to man or the larger animals, at least in our island, proves almost immediately destructive to small creatures, such as mice, frogs, and young birds, on which it habitually feeds. Open copses, dry heaths, and sandy spots are its favourite resort. It hibernates intertwined with several of its own species. The tail is blunt compared with the common snake. The colours vary considerably, according to sex, age, and climate. Its length is from a foot and a half to two feet. The number of young produced at a birth varies from twelve to twenty. The adder is found generally throughout Europe, from the north of Russia to the south of Italy and Spain. It occurs in England and Scotland, but not in Ireland. The death-adder is a species of *ACANTHOPIUS*, and the *PURP-ADDER* a species of *Coluber*. See SERPENTS.

ADDER'S-TONGUE (*Ophioglossum*) is a plant belonging to the class OPHIOGLOSSACEÆ of vascular cryptogams. It is nearly allied to Ferns, but the unfolded fronds are not coiled, and the spore-cases have no elastic ring. It is unlike ordinary ferns in appearance, consisting of a single, undivided frond, with a stalk-like branch at its base at the upper end of which are clustered the spores in two lines on opposite sides. The growth of the frond is remarkably slow. For three years after it first buds it remains underground. During the second year the leaf reaches into the two parts which are afterwards to become the frond and spore-bearing stalk; these are further developed in the third year; and at length, in the fourth year, they appear above ground. The adder's-tongue was only valued by herbalists, and is still used by country people as a remedy for wounds.

ADDISON, JOSEPH, was the son of the Rev. Lancelot Addison, who eventually obtained the deanery of Lichfield, but was, at the time of the birth of his son, rector of the parish of Milston, near Amesbury, in Wiltshire. Here Addison was born on the 1st of May, 1672. After the early discipline of two provincial schools he was sent to the Charter-house, and was there a fellow-pupil with Richard Steele. About the age of fifteen he was entered at Queen's College, Oxford; but he removed to Magdalen College upon obtaining a scholarship two years afterwards. His facility of reciting Latin verse first brought him into reputation at the university. The first composition which he gave to the world in his native language was a copy of verses addressed, in 1691, to Dryden, which procured him the acquaintance of that distinguished poet.

Addison had very early made some advantageous connections with official persons, particularly with Lord Somers and Mr. Montague, afterwards Lord Halifax. He gave up his design of entering the church, and obtained a pension from the crown, which he lost on the death of King William. The great victory of Blenheim was supposed to require a dignified poem for its celebration; Addison was engaged to write "The Campaign," and was rewarded with office, holding several appointments from 1704 to 1710, when a change of ministry released him from the official duties for which he was probably but little fitted. He was in Ireland when the first number of the *Tatler* appeared, on the 12th of April (o.s.) in 1709—the happy idea of Steele. The active part which he immediately took in the conduct of this periodical work is well known. The *Tatler* terminated on the 2nd of January, 1711; but on the 1st of March following appeared its still more celebrated successor, the *Spectator*, which was continued till the 6th of December, 1712, and of which, during the whole of that time, Addison was undoubtedly the chief support. The *Spectator* was followed by the *Guardian*, of which the first number was published on the 12th of March, and the 175th and last on the 1st of October, 1713; and in this also his pen was actively employed. The same year he acquired still greater fame than any of his former productions had brought him by his celebrated tragedy of "Cato," which was received with extraordinary applause, both on the stage and when it issued from the press. On the 18th of June, 1714, appeared the first number of a continuation of the *Spectator*, in which Addison also assisted till its termination on the 20th of December in the same year. On the 23rd of December, 1715, soon after the breaking out of the Rebellion, he commenced a periodical publication in support of the government, under the title of the *Franchholder*, which he continued, without assistance, at the rate of two papers a week, till the 29th of June in the following year. He had now, indeed, for some time been again engaged in public affairs. In 1716 he married the Dowager Countess of Warwick; and in April of the following year he was nominated one of His Majesty's principal secretaries of state. He soon, however, found it necessary to resign this high employment—retiring professedly on the ground of ill-health, but in reality, as has been generally understood, in consequence of his entire inaptitude both for debate in Parliament and for the ordinary business of his office. His health had been for some time impaired by attacks of asthma—the effects of which were probably in no slight degree aggravated by a habit of over-indulgence in wine, to which he had long been addicted, but to which after his marriage he gave himself up more than ever, seeking refuge in its baneful excitement from domestic unhappiness. He left office in March, 1718. It was hoped at first that his release from official duties would have brought about his restoration, and for some time the expected effect seemed

to follow. He again, however, fell ill, and, after lingering for some time, at last expired at Holland House, Kensington, on the 17th of June, 1719, when just commencing his forty-eighth year. He left a daughter by the Countess of Warwick.

The literary greatness of Addison in the estimation of his contemporaries probably stood upon somewhat different grounds from those upon which it is now usually placed. In his own day he was looked upon as a dramatist and a poet of a very high order. The taste which then prevailed in poetry was the most artificial which has distinguished any age of English literature. The return of the public mind to truer principles of judgment in such matters has been fatal both to the dramatic and to the poetical fame generally of Addison. His glory is now that of one of our greatest writers in prose. Here, with his delicate sense of propriety, his lively fancy, and above all, his most original and exquisite humour, he was in his proper walk. He is the founder of a new school of popular writing, in which, like most other founders of schools, he is still unsurpassed by any who have attempted to imitate him. His *Tatlers*, *Spectators*, and *Guardians*, gave us the first examples of a style possessing all the best qualities of a vehicle of general amusement and instruction, easy and familiar without coarseness, animated without extravagance, polished without unnatural labour, and from its flexibility adapted to all the varieties of the gay and the serious.

ADDISON'S DISEASE is the name given to an obscure malady first described by Dr. Thomas Addison, of Guy's Hospital, the most marked feature of which is the gradual bronzing of the skin, which goes on until the patient assumes the appearance of a mulatto. It is attended by great weakness and debility, and generally proves fatal at the end of a period of about eighteen months. It may be necessary to note, however, that darkening and discoloration of the skin frequently arises from other causes, and is not necessarily the sign of disease.

ADDITION, from the Latin *addo*, to put to, is the putting together of two or more magnitudes into one. In arithmetic and algebra it also signifies the most convenient method of doing this, so that the sum or collection of added quantities may be counted or reckoned in the same manner as the parts of which it was composed. The sign of this operation is +, which is generally called *plus*, the Latin for more. Thus $a + b$ (*a plus b*) directs us to add the number denoted by *b* to that denoted by *a*, and represents the sum of *a* and *b*.

We need say nothing of common addition of integers in arithmetic.

The addition of fractions is, in principle, as follows:—We cannot immediately express the sum of one-half of a foot and one-third of a foot otherwise than by writing $\frac{1}{2} + \frac{1}{3}$ foot. But if we recollect that one-half is *three-sixths*, and one-third is *two-sixths*, it is evident that the sum of one-half and one-third is *five-sixths*. The rule therefore is—Reduce the various fractions to others of equal value and having the same denominator, add the numerators, retaining the denominator. Or, multiply every numerator by every denominator except its own, add the results, which gives the numerator of the sum; multiply all the denominators together for the denominator of the sum. Thus, using \times as the sign "multiply," to work out $\frac{2}{3} + \frac{4}{5} + \frac{5}{7}$ which is 132

$$2 \times 7 \times 5 = 70$$

$$3 \times 3 \times 5 = 45$$

$$4 \times 3 \times 7 = 84$$

Adding these we get 199, numerator.

Multiplying " $3 \times 7 \times 5 = 105$, denominator.

To add decimal fractions, arrange them so that the decimal points shall fall under one another; proceed as in common addition, and let the decimal point in the sum total be placed under the other decimal points:—

$$\begin{array}{r} 2.61 \\ .118 \\ \hline 2.728 \end{array} \qquad \begin{array}{r} 14.103 \\ 118 \\ \hline 132.103 \end{array}$$

To add algebraical quantities, write them all one after another, without changing any sign, and connect the terms which before had no sign with the rest, by the sign +. Thus $a + b$ and $a - 2b$ added, give $a + b + a - 2b$. This is the sum, which may be reduced to a simpler form by observing that *b* subtracted twice and added once, is equivalent to *b* subtracted once, and that *a* is added to *a*. The expression then becomes $2a - b$. (The sign — is called *minus*, and signifies "subtract.")

When the quantities are fractional the preceding rule follows the application of another similar to the rule in fractional arithmetic. Thus for

$$a \div b + a \div b \text{ the sum of which is } \frac{a^2 + b^2}{a^2 - b^2}$$

$$a \times (a - b) = a^2 - ab$$

$$b \times (a + b) = ab + b^2$$

$$\text{Adding, we get } \frac{a^2 - ab}{a} + \frac{ab + b^2}{a} = \frac{a^2 + b^2}{a}$$

$$\text{and } (a + b) \times (a - b) = a^2 - b^2, \text{ denominator.}$$

ADEL. See **SORMANI**.

AD'ELAIDE, the capital of the British colony of South Australia, is situated on the eastern shore of the Gulf of St. Vincent, about 60 miles from its entrance. It was founded in 1836, and named after Queen Adelaide. It is about 5 miles from the coast, and is divided by the river Torrens into North and South Adelaide, the latter being the commercial district. The streets, which intersect each other at right angles, are wide, and planted with trees. In King William Street are several of the public buildings, including the government offices, a new building of white stone, and the general post-office. The government-house is a handsome edifice, surrounded by ornamental gardens. There are a convenient exchange, some well-furnished beer-houses, many good shops and well-appointed hotels, a theatre, cathedral, and numerous churches and chapels, many of them handsome buildings. Adelaide also possesses a university, public library, and museum, various benevolent and other institutions, and botanical gardens. There is also a public place of recreation, called the Park Lands. In North Adelaide is the bishop's residence. Water-works have been erected at a cost of £250,000; the city is well lighted; and the sewage is used for purposes of irrigation. Various manufactures are carried on, and in the vicinity are copper, iron, and gold mines. The city is governed by a mayor and corporation. The population in 1882 was 40,000.

Port Adelaide is 7 miles N.W. from the city, with which it is connected by rail. It is situated in a mangrove swamp upon a creek, which is entered from the gulf between two extensive sand shoals, through a narrow channel constituting the outer bar. Vessels of 800 tons register can enter the port at all times; but larger ones are compelled either to lighten or to wait for a full tide before they can venture to cross the bar. It possesses some good buildings and well-furnished streets, and is a free port. The exports are grain, wool, copper, lead, and other products. The imports are chiefly iron goods, machinery, drapery, wines and spirits, and paper. The population is 3000.

ADELSBERG, a market town of Austria, in the province of Carniola, about 22 miles N.E. of Trieste. It

celebrated for the great caverns in its environs, the two principal of which are the cavern of Adelsberg, which is about 8500 feet long, and the Magdalena cavern, which has been explored for a length of about 1200 feet. The former is the more remarkable, being the largest and most magnificent in Europe. It consists of several spacious grottoes, which are from 60 to 100 feet high, in one of which a grand ball is held every Whit-Monday. Splendid stalactites hang down from the roofs and cover the walls, and present a beautiful appearance by torchlight. The Poik, a little river, throws itself into the cavern, and after forming several cascades, disappears through a fissure in the rock, but continues its subterranean course for nearly 8 miles, till it appears again near Malingradu-Kleinhausel, where it is called Unze. It disappears once more in the caverns of Laase, and comes again to the surface near Ober-Laibach, as a navigable river, called the Laibach. In those parts of this river which are subterranean, and especially in the cavern of Adelsberg, the Proteus is found. See PROTEUS.

ADEN, a town and harbour on the southern shores of Arabia, in the province of Yemen. Before the British took possession of it, Aden was an ill-supplied, miserable place, consisting of a small number of mud huts covered with mats, and containing about 600 inhabitants; but since that time a vast change has taken place. Hotels for the accommodation of the passengers by the various steamers on the route to India and China have been erected, and the population of the vicinity, attracted by the security for life and property afforded by the British flag, have flocked in large numbers to the place, which in 1882 contained 35,000 inhabitants. Defensive works have been constructed, which are considered to render it impregnable, and make it the Gibraltar of the Red Sea. Its great deficiency formerly was the supply of water, which is now obtained partly from wells sunk in the solid rock, and partly by means of an aqueduct 7 miles in length. It rains only once in three years, when it descends in torrents for about a fortnight in September. To husband the rain-water the British restored several ancient reservoirs, at a cost of £1,000,000, in order to supply the inhabitants in dry weather. The climate is healthy and agreeable, its heat being tempered by the sea breezes. In fact, the town was called Aden, or Eden (Paradise), by the Turks, in consequence of its rich trade and splendid climate. The hot season prevails from April to October.

The town is built at the eastern base of a mountain mass called Jebel Shamsan, which rises 1776 feet above the sea level. This mass forms a peninsula, which is united to the mainland of Arabia by a narrow, low, sandy isthmus about 3 miles in length. It has two harbours, which are considered the best on the coast of Arabia. The smaller one near the town is divided into two small bays by a fortified rocky island called Sirah, which is about 430 feet high, and commands the harbours and town. The small creek which used to separate the island from the mainland has been filled up, so that at low water it is now joined to the coast. The anchorage in the bays is very regular, and a vessel may choose her own position in from 5 to 19 fathoms water. But it is only safe for three months, from June to August, when the wind blows from the westward, during which time there is always smooth water close to the island. At other seasons the anchorage is exposed to the prevailing winds and to the swell of the sea. The other harbour, which is called by seamen the Back Bay, and by the Arabs Bander awayi, lies west of the peninsula, and has on the eastern side of its entrance another mass of rocks called Jebel Shamsan, which rises 1237 feet above the sea. The entrance between these two masses is nearly 4 miles wide. The bay stretches northward about the same distance, but at

its eastern extremity is a smaller bay, extending to the isthmus which unites the Jebel Shamsan to the mainland. A ship may anchor in any part of this bay, which has a clear sandy bottom. The Jebel Shamsan protects the anchorage against the prevailing winds and the swell. The tides are strong and irregular, owing to the influence of the outside currents.

Aden appears in remote times to have been a place of importance. It occurs in the "Periplus" under the name of Eudainon, or the Prosperous. Alfonso Albuquerque made an abortive attempt to take it for Portugal in 1513. The Turks having got possession of it in 1538 by treachery, greatly increased the fortifications, and built an aqueduct more than 7 miles long through the isthmus, by which the town received an ample supply of water. As the power of the Turks gradually declined, the Arabians threw off their yoke, but the time when Aden became free is not precisely known. In 1708 it was governed by its own prince. The trade of the place, which had gradually been declining, received a fresh impetus from the establishment of the Red Sea route to India, about the time it came into the possession of the British. This was brought about by a demand for satisfaction from the sultan, in consequence of the plunder of an English vessel which had become wrecked on the coast. Negotiations were entered into at the same time for the transfer of the place to British rule, and an agreement to that effect was arrived at. Upon an attempt being made by the sultan to withdraw from the contract, Aden was forcibly seized in 1839. The port is free from customs duties, and has a large export trade in coffee, gum, ivory, pearls, &c. Its imports consist of cotton and silk goods, and grain, but the principal item is coal for the use of passing steamers. Aden has telegraphic communication with Suez and Bombay.

ADERNO, a city in the province of Catania, Sicily, standing on the ruins of the ancient *Hadranum*, celebrated on account of its temple of Hadranos, which was guarded by 1000 dogs. It is near the base of Mount Etna, the lava from which furnished the pillars of the principal church, and which was also used in many other buildings. In the vicinity are some beautiful falls of the river Simeto. Population, 16,000.

ADERSBACH ROCKS, the name of a remarkable collection of freestone rocks in a valley of the Riesengebirge. It extends, with some interruptions, from the Bohemian village of Adersbach to the mountain Henschel, in the Silesian county of Glatz. The mountain descends perpendicularly to a depth of from 600 to 1200 feet, and there are only a few paths by which access can be gained to the labyrinth below, which consists of detached masses of rock lying in picturesque confusion. Some are as large as moderate-sized houses, and others have the appearance of churches, pyramids, and similar buildings. On following a stream of pure water, which has its source in the centre of the labyrinth, the traveller passes by small crevices through a wall of sandstone of stupendous height, and enters a chaos of isolated columns, walls, towers, and other fragments of rock, of the most extraordinary description, varying in height from 100 to 200 feet. The most striking is that which is called "Der Umgekehrte Zuckerhut," or "The Inverted Sugarloaf." This remarkable spot is annually visited by many travellers, and has especially attracted the attention of geologists. It is supposed that the whole, which extends over many square miles, was originally one solid mass of sandstone, which has been split by volcanic action, and afterwards washed out by water.

ADHESION. This term has generally been employed to denote the property by which two solids, a solid and a fluid, two solids and an interposed fluid, or two fluids, remain attached to each other when their surfaces are

brought into contact. Adhesion, in some instances, may be considered as little if at all different from cohesion, and dependent upon the same cause; while in other cases it appears to be connected with, and probably to a considerable extent derived from, chemical affinity. When, for example, two surfaces of lead are pressed together the adhesion resembles mere cohesion; it acts at insensible distances like that power, and no change of properties ensues in the metal. If, however, the surface of a piece of lead is put into contact with mercury, the two metals act upon and combine with each other, and an amalgam is produced by chemical affinity. There are other instances in which the adhesion is not distinctly to be referred to cohesion, and in which it certainly does not depend upon chemical affinity, as when a plate of glass adheres to the surface of mercury, or liquids rise in small tubes by capillary attraction.

ADHESION, in botany, is a term used when describing the extent of union between the unlike parts of the flower; that is, between one and another of the calyx, corolla, stamens, and pistil (or ovary). If the calyx and ovary are not united, the calyx is said to be *superior* and the ovary *inferior*; but if united even partially, the calyx is *inferior* and the ovary *superior*. When the calyx and corolla are quite separate, the corolla appears to spring from a lower level than the ovary, and is said to be *hypogynous* (i.e., under the pistil); when, through excessive growth of the stalk at the insertion of the calyx, the corolla is carried up to a higher level, and seems to spring from the calyx, it is said to be *perigynous* (i.e., around the pistil); but if the calyx is at the same time united to the ovary, the corolla will then spring from the top of the ovary, and in this case is *epigynous* (i.e., upon the pistil). The same terms are applied to the stamens as to the corolla, and in addition another term is used, viz., *epipetalous* (i.e., upon the petals), when the stamens are inserted upon the corolla.

AD HOMINEM (Lat., to the man). The argument *ad hominem* is one appealing, not to the facts in question, but to the principles or consistency of conduct of the person addressed. This is perfectly allowable, as Whately remarks, when the opponent's prejudices or weakness does not allow him to give due weight to fair general argument. But if a deceitful attempt be made to advance this argument as the proper conclusion, then it becomes a fallacy belonging to the class known as *ignoratio elenchi* or *irrelevant conclusion*. The argument *ad populum* (to the people) is one of the same nature, but addressed to a multitude instead of to an individual.

ADIANTUM (ἄδιαντον), a genus of ferns, so called by the Greeks because the leaves are of such a nature that water will not readily moisten them. The plant described by Hippocrates and his successors under this name appears to have been the *Adiantum Capillus-veneris*, or the maiden-hair fern—a rare European species occasionally met with on moist rocks and old damp walls even in this country.

The genus is scattered over all the world from Europe to New Zealand, but is not found in any high latitudes in either hemisphere. By far the greater part of the species inhabit damp tropical woods. The pinnules (or leaflets) of the fronds are lobed. The upper edges of the lobes are turned back, and altered to a membranous texture, bearing on their under surfaces the groups of *spore-cases*.

Adiantum Capillus-veneris is the only British species. It is a dark-green stemless plant, found in damp, sharp, rocky places by the side of water-courses and on the edge of springs, where the air is keen and dry. It is admirably fitted for a Warden case.

CAPILLARIE is prepared by pouring boiling syrup upon the leaves of this species, or of *Adiantum pedatum*, an American plant of larger growth and far less divided

leaves. A little flavour is afterwards given with orange flowers.

AD'IGÈ, the *Athenis* of the Romans, next to the Po the largest river of Italy, rises in the Alps of Tyrol above Brixen, and, after passing Roveredo, Verona, and Legnano, falls by several mouths into the Adriatic between the Brenta and the Po. From its rise to Verona the course is nearly south, and thence almost due east to its mouth, the total length being about 220 miles. It is a deep and rapid river. Below Verona it has a width of from 300 to 500 feet, and the neighbouring lands are often injured by its inundations. Its banks have repeatedly been the scenes of military operations in the Italian wars. Its German name is Etsch.

AD'IPOCERE (pron. ad'i-po-sēr), a substance so named from *adeps*, fat, and *cera*, wax, because it possesses the properties partly of fat and partly of wax. It is a body of a peculiar nature, being intermediate between fat and wax, and bearing a close resemblance to spermaceti. The name was given to the substance in question by M. Fourcroy in 1786. There was in Paris an immense burial-ground, called La Cimetière des Innocents. This place had been the receptacle of the dead for a considerable part of the population of Paris for several centuries; but on account of some improvements in the neighbourhood it was determined to remove it. The number of burials had amounted to some thousands annually. The bodies were deposited in pits or trenches about 30 feet deep; each pit was capable of holding from 12,000 to 15,000 bodies; and as the pits became full they were covered with a few feet of earth. The extent of the whole area was about 7000 square yards, and this space became at last occupied by a mass which consisted almost entirely of animal matter, rising several feet above the general level of the soil. Scientific men were especially charged by the government to direct the precautions requisite for securing the health of the workmen in removing this immense mass of putrefying animal matter; among whom were Fourcroy and Thouret, the latter of whom has given a most interesting account of the circumstances attending the opening of the ground, and the former an analysis of the new and singular object that presented itself for investigation. The coffins were found to be in a good state of preservation, but the bodies they contained presented a flattened appearance, and had become changed into adipocere, with the exception of the bones, which remained, but had become exceedingly brittle. From various observations it was found that this fatty matter was capable of enduring in these burying-places for thirty or forty years, but that ultimately it became corrupted and was dissipated.

This substance thus presented for examination under such remarkable circumstances was considered by M. Fourcroy as an ammoniacal soap, formed of a peculiar oil combined with ammonia. M. Chevreul ("Recherches sur les Corps Gras") found that adipocere consisted of a large quantity of margaric acid, and a small quantity of oleic acid, combined with a little ammonia, potash, and lime. A similar substance found in peat is called "bog butter."

AD'IPOSE SUBSTANCE (*adeps*, fat). **ADIPOSE TISSUE** (*Tela adiposa*, Latin; *Tissu graisseux*, French). Adipose substance, or fat, is an animal oil which resembles, in its essential properties, the vegetable oils. It is wholly inorganic, though contained in an organized tissue.

Until modern times, fat was conceived to be a simple principle constituting one of the elements of the animal organization; but M. Chevreul, who examined this substance with extraordinary diligence, demonstrated that it is not a simple principle, but that it consists of two substances which are capable of being separated from each other, and obtained in a distinct form. Of these substances one, at the ordinary temperature of the atmosphere, is

solid; the other fluid. To the solid substance he gave the name of *stearine* (from *stear*, fat or suet), and to the fluid substance *elaine* (from *elaion*, oil). Stearine, the solid portion of fat, is a colourless, tasteless substance, nearly inodorous, soluble in alcohol, separable from this solution in the form of small silky needles, and preserving its solidity at a temperature of 99° Fahrenheit. Elaine, the oily principle of fat, is fluid at the temperature of 60° Fahrenheit; it is of a yellow colour, without odour, lighter than water, its specific gravity being 0.913, and easily soluble in alcohol. The difference in the fluidity, or the melting-point of the fat of different animals, depends on the proportions in which these two substances are combined—in the more solid the stearine, in the less consistent the elaine being in excess.

By chemical analysis the materials of fat, like those of all the other secretions, are found to be contained in the blood, and fat globules are seen in the blood under the microscope.

The chief functions which the adipose substance performs in the animal economy are—1. Its accumulation in the system serves as a reservoir of inflammable matter for the generation of animal heat, and it often actually maintains a process of combustion no less than the oil of the lamp. [See ANIMAL HEAT.] 2. In the second place, it serves a most important use in obviating the effects of excessive nutrition. When too much food is taken, or when the secretions and excretions are suppressed, grievous evils would arise, and death would often ensue, if there were no provision for the removal of this superfluous matter. One of the most important of these provisions is the deposition of fat, by which the system is lightened of a burden; and the circulating system especially is relieved of a fulness and tension of its vessels, which might induce in them a fatal state of action. The secretion of fat from the blood, and the deposition of it in its various receptacles, is thus one of the safety-valves of the constitution. In man no other solid is ever formed so quickly as this sometimes is; but in some animals, in certain states of the atmosphere, a prodigious accumulation of it takes place in the course of a few hours. 3. The deposit of fatty matter often assists the action of moving parts, by giving them support without interfering with their free motion; thus the eye rests on a cushion of fat, on which it can turn freely, and through which the muscles pass that keep it in play.

Sometimes the accumulation of fat is enormous. The average weight of the human body, when well nourished and of a medium size, is about 160 pounds, or between 11 and 12 stone; yet instances are on record of its attaining, by the deposition of fat, the weight of from 35 to 40 stone. Dr. Cheyne mentions a case in which the weight was 458 pounds, equal to 32 stone. In the *Philosophical Transactions* are recorded two cases, in one of which the weight was 180 pounds, and in the other 590 pounds. The Breslan Collections contain two other cases, in one of which the weight was 580, and in the other 600 pounds.

ADJECTIVE, the name of one of the parts of speech, or one of those great classes into which grammarians have distributed the words of a language. The term *adjective*, which is of Latin formation, signifies something that *adds to*, that is, more exactly describes any object. An adjective, in our language, is most commonly prefixed to the name of something, to mark some quality by which it is distinguished from other things belonging to the same class; thus, a *bad* man, a *good* man, a *fat* man, a *troublesome* man; a *black* horse, a *white* horse, &c. Here the terms *man* and *horse* are the most general or abstract terms by which we can express the idea of man or horse; but by adding to them such adjectives as *bad*, *good*, &c., we limit the class of which we are speaking. Thus, when we speak of a *white* man, we exclude black men or men of

any other colour. In like manner, when we say an *English* man, we limit the signification still further; and in this we may descend to a Cheshire man, a Chester man, until we come to individuals indicated by a common name, such as Thomson, Smith, &c. By the aid of other words prefixed, such as *John*, *William*, &c., we at last come to some certain individual. It appears, then, that in the expressions *John* Page, *William* Smith, &c., *John* and *William* may be called adjectives as well as the words *black*, *white*, &c. Frequently *nouns*, or names of things, can be used like adjectives; thus we can say, a *silver* ring, a *gold* stick, *salt* water, *sea* water. Many words in English are, in fact, used both as nouns and adjectives. In the expression "John's book," *John's* may be considered as an adjective, for the reasons just given. Some grammarians have wished to introduce the term *adnoun* instead of *adjective*, but though the word *adjective* is not a very good name, *adnoun* is no better.

There are two ways in which an adjective can stand in a proposition: we can say, "the horse is bad," or "a bad horse." In the first example, *horse* is called the "subject," *is* the "copula" or connecting link, and *bad* is the "predicate" or qualifying term. Some words are used both as adjectives and adverbs. In English the adjective is almost invariably placed before the noun which it qualifies, but in most other languages—especially French and Latin—it is usually placed after it.

By modern grammarians the words *a*, *an*, and *the*, formerly described as the indefinite and definite articles, are now included as adjectives; *a* or *an* being equivalent to *one*, and *the* an abbreviation of *that*.

Many adjectives are simple roots, such as *good*, *bad*, *hot*, &c., while others are formed by adding an affix or suffix to a noun, as *play-ful*, *naught-y*; other adjectives have affixes derived from the Greek, as *adamant-ine*; or from the Latin, as *station-ary*, *verb-ose*.

ADJUDICATION, a legal term used both in English and Scottish law, though with different meanings in the two systems. In English law it is employed to signify the judicial determination at a certain stage of the proceedings in bankruptcy. By the Bankruptcy Act a single creditor, or two or more creditors, if the debt due to each or all of them amounts to more than £50, may present a petition to the court praying that the debtor may be adjudged bankrupt, and setting forth in their petition one or more acts of bankruptcy on his part. Should the proof of debt and act of bankruptcy be sufficient, an adjudication is made by the court that the debtor is bankrupt, and his property becomes divisible among the creditors in proportion to the debts proved by them.

Adjudication, in the law of debtor and creditor in Scotland, is a process for attaching heritable or real property. It is applicable not merely to land and its accessories, but to all rights "bearing a tract of future time," as annuities, pensions, lands, &c., and has in general been extended to all such property capable of being applied to the liquidation of debts, as is not attachable by the simpler process of arrestment. According to modern practice, there are two alternatives laid before the debtor in the process—that the debtor is to make over to the creditor land to the value of his debt and one-fifth more, redeemable within five years; or, that the property in general against which the process is directed shall be adjudged to the creditor, liable to be redeemed within ten years, on payment of the debt, interest, &c. The latter is the alternative universally adopted. The lands do not become the absolute property of the adjudger at the end of the ten years without judicial intervention, in "an action of declarator of expiry of the legal," in which the debtor may call on the creditor to account for his transactions, and may redeem the property on paying any balance that may be still due.

When there are so many adjudications in process against an estate that it may be considered as bankrupt, while the debtor does not come within the class of persons liable to mercantile bankruptcy, it is usual to sweep all the operations into one process, called a "Judicial Sale and Ranking." A factor or assignee is appointed, under judicial inspection, and to a certain extent, but very imperfectly, the property is realized and distributed among the creditors after the manner of a bankrupt estate. When sequestration has been awarded against a person liable to mercantile bankruptcy, the award involves an adjudication of his adjudicable property from the date of the first deliverance.

The form of an adjudication has long been in use for the completion of defective titles to lauded property, and when so employed it is called "Adjudication in Implement."

ADJUSTMENT, in marine insurance, is the settling and ascertaining the exact amount of indemnity which the party insured is entitled to receive under the policy, after all proper allowances and deductions have been made; and fixing the proportion of that indemnity which each underwriter is liable to bear. The contract of insurance is an agreement to indemnify the insured against such losses as he may sustain by the occurrence of any of the events which are expressly, or by implication of law, contained in the policy. When a ship is lost, or any of those contingencies arise against which the insurance provides, the owner of the ship or of the goods insured, as the case may be, or an authorized agent, reports the circumstance to the insurers or underwriters. The amount of damage being ascertained, the amount which each underwriter has made himself liable to by subscribing the policy, is settled; and this being done, it is usual for one of the underwriters, or their agent, to indorse the policy, "adjusted a partial loss on this policy of so much per cent." To this indorsement the signature of each underwriter must be affixed, and this process is called the adjustment of the loss.

After an adjustment has been made it is usual for the underwriter to pay the loss at once, and the indorsement is regarded as *prima facie* evidence of the debt, not to be disproved, except by showing that fraud was used in obtaining it, or that there was some misconception of the law or fact upon which it was made.

ADJUTAGE or **AJUTAGE** is a name given to a tube, generally not exceeding a few inches in length, which may be applied to a vessel or reservoir, in order to facilitate the discharge of a fluid from such vessel.

The velocity with which a fluid issues from a very small orifice in the side of a reservoir, is equal to that which is due to a body falling in vacuo through the vertical distance of the upper surface of the fluid from the level of the orifice; but the discharge given by this rule must be considerably diminished when we would estimate that of a fluid through a large aperture, on account of the contraction which takes place in the vein of effluent water at a short distance from the orifice. The application of a short tube to the orifice increases, however, the quantity discharged in a given time; and the fact must have been known to the ancients, since Frontinus has a passage indicating such an effect in his treatise "De Aquæductibus."

ADJUTANT (from the Latin *adjuro*, I help) is a military officer attached to a garrison, a regiment, or a battalion, being usually chosen from among the regimental officers. His duties are to receive all garrison or regimental orders, and promulgate them to the captains of companies in the regiments to which he belongs. Under the major he regulates all the routine of discipline in the regiment or battalion. Thus the adjutant is the assistant or *helper* of the commanding officer. An adjutant of volunteers also acts as paymaster, part of his duties being to receive, disburse, and account for the allowance granted by government.

ADJUTANT, ADJUTANT CRANE, or ARGALA (*Mycteria argala*). This gigantic crane, a native of the warmer parts of India, is closely allied to the marabou of Africa, but is of larger size, measuring from the tip of the beak to the toes $7\frac{1}{2}$ feet, and in extent of wing from 14 to 15 feet; while in its ordinary attitude, erect, it stands about 5 feet in height. Its beak is exceedingly large and powerful, with a proportionate enlargement of skull and musculature of neck; and both head and neck are bare of feathers, and only sprinkled with hairs. A large pouch of skin hangs like a dewlap from the lower part of the neck, adding to the bird's uncouth appearance. Its voice is loud and roaring. Its appetite is extremely voracious, and all animal substances, whether fresh or putrescent, are greedily devoured. Vermin of all descriptions, tortoises, lizards, snakes, frogs, small quadrupeds, and birds, constitute its habitual food, together with carrion and other offal matters. These birds are often seen in companies near the mouths of rivers or along the shore, and in the distance may be easily mistaken for men picking up shells on the beach. In its native regions the argala, like the vulture and hyæna, is serviceable in clearing the fields, lanes, and even streets, of putrescent matters; it is a public scavenger, and as such not only tolerated but even respected in India by the natives, who are indignant against those who molest it. Everything is swallowed whole; and so accommodating is its throat that a leg of mutton, a hare, a fox, or a cat, are gulped down by one effort. A tortoise, 10 inches long, and a large black male cat, entire, were on one occasion found in the stomach of an argala. The bones of its prey are rejected after a time, as is the case with carnivorous birds generally.

In captivity the argala becomes familiar and confident, but it requires to be watched narrowly, as it seizes upon meat, chickens, fowls prepared for cooking, and other articles of animal food; it is, however, by no means courageous, its powers and voracity being far superior to its prowess, and it may be repelled even by a child if aimed with a stick.

The general colour above of this bird is ash-gray, the under parts white, and the skin of the neck red. The under tail coverts are delicate flowing plumes of most exquisite texture, and are very valuable, as are also those of the African species (*Mycteria marabou*). These plumes are known by the common appellation of *marabou*. The JABBER also belongs to the genus *Mycteria*.

The argala ranges under the order GRALLÆ.

ADJUTANT-GENERAL is a military officer of high rank on the staff of the commander-in-chief. His duties are to receive the general orders, and cause them to be communicated to the generals of brigade; to receive all reports relating to the state and efficiency of the different regiments, and submit them to the commander-in-chief; and to him all applications of officers for leave of absence must be made. In short, he may be described as the staff-officer specially charged with all matters relating to the discipline and drill of the army. Previous to an action the adjutant-general usually superintends the drawing up of the infantry.

AD LIBITUM (Latin), at pleasure. In music, a phrase used to signify that the passage may be taken at the pleasure of the performer as to time and expression. "Violin ad lib." (the usual contraction of *ad libitum*) means that the accompaniment of the violin is merely an enrichment not necessary to the completeness of the piece.

ADMINISTRATION and **ADMINISTRATO** An administrator is a person appointed by the Court Probate to make administration of, or to distribute the goods and chattels of a person who dies without having made a will. The statute of 31 Edward III. c. directed the ordinary, in case of intestacy, to depute "th

nearest and most lawful friends" of the deceased to administer his goods; and administrators thus appointed are put upon the same footing, with regard to suits and to accounting, as executors appointed by will: the nearest and most lawful friend of the deceased denotes the nearest relation by blood who is not under any legal disability. The statute of 21 Henry VIII. c. 5, permits the ordinary to grant administration either to the widow or the next of kin, or to both of them; and, where several persons are equally near of kin, it empowers him to select one of them.

If none of the kindred take out administration, a creditor is permitted to do so; and in the absence of any person entitled to demand letters of administration, the ordinary may appoint as administrator any person whom he may think proper. Administrators are appointed when a will has been made, if no executors are appointed by the will, or if the persons named in it refuse, or are not legally qualified to act; and in any of these cases the administrator only differs from an executor in the name of his office and mode of his appointment, with the exception that an executor may do many acts before he proves the will, but an administrator can do nothing till letters of administration are issued. When the executor refuses to act, it is usual to grant administration to the residuary legatee, that is, to the person to whom, by the will, the remainder of the personal property, after payment of debts and legacies, is given.

An administrator has, with two sureties, to enter into a bond for the faithful discharge of his duties, which are to collect all the goods and chattels, to get in the debts, to pay the funeral expenses of the intestate, and the expense of obtaining the letter of administration; and to pay the debts of the intestate, and then to distribute what remains, pursuant to the "Statute of Distribution," 29 Charles II. c. 3, and 1 Jas. II. c. 17. The next of kin, among whom either part or the whole of the property may be distributable, are ascertained according to the Roman law. [See CONSANGUINITY.] In difficult trusts an administrator may at any time apply to the Chancery Division of the High Court of Justice for directions how to act, and the costs of such application are allowed to be defrayed out of the estate. The statute of 29 Charles II. c. 3, confirms the right of the husband to be the administrator of his wife, who dies intestate, and to recover and enjoy her personal property.

Many of the provisions of the "Statute of Distributions" resemble those of the Roman Law of Justinian's period.

ADMIRAL, the title of the highest class of British naval officers. Admirals are also called "flag-officers;" and were formerly distinguished as admirals of the Red, of the White, or of the Blue, according to the colour of the flag they were entitled to fly when in command of a squadron. These distinctions were abolished in 1864, and the white ensign was thenceforth adopted as the sole flag for ships of the royal navy. Of the rank of admiral there are three degrees—admiral, vice-admiral, and rear-admiral. Admiral of the fleet is a mere honorary distinction, which gives no command, but merely an increase of half-pay.

Admirals of the fleet rank with field-marshal, admirals with generals, vice-admirals with lieutenant-generals, and rear-admirals with major-generals of the army, according to the dates of their commissions. Admirals of the fleet must retire at seventy years of age, admirals and vice-admirals at sixty-five, and rear-admirals at sixty, or when ten years have elapsed after their flag has been faded down. Rear-admirals have the option of retiring fifty-five, and others at sixty. The half-pay of an admiral of the fleet is £3 7s. per day; admiral, £2 2s.; vice-admiral, £1 12s. 6d.; and rear-admiral, £1 5s.; and the retiring pay is:—

	Per Annum.	Years' Service.
Admirals, . . .	£850	80
Vice-admirals, . . .	725	29
Rear-admirals, . . .	600	27

An addition of £20 for admirals, and £15 for vice and rear admirals, is made for each full year of additional sea service, or its equivalent in harbour service or half-pay time, but the same must not exceed five years; and a similar deduction is made for each full year wanting to complete the periods specified, the same, however, not to exceed ten years. The daily pay of admirals in commission is—admirals, £5; vice-admirals, £4; and rear-admirals, £3; in addition to from £2 to £1 10s. per day for table money, and from £200 to £500 per annum in lieu of domestics.

The word admiral is said to be merely a corruption of the Arabic *Amir* or *Emir*, a lord or chieftain. Milton wrote *ammiral* in English, and in Latin *Ammiralatus Curia* (the Court of Admiralty). The French say *amiral*, and the Italians use *ammiraglio*. Formerly there was no officer with the title of admiral in the navy of the United States of America, the rank corresponding to it being that of commodore, which is given to captains commanding on stations. During the civil war, however, between the Northern and Southern States of the Union, the term admiral was given to their principal naval commanders. The holy wars of the twelfth and thirteenth centuries seem to have introduced the term admiral into Europe. The admiral of Sicily was one of the great state officers in that kingdom in the twelfth century, and soon after this time the Genoese had also their admiral. In France and England the title appears to have been unknown till the latter part of the thirteenth century; the year 1281 is commonly assigned as the date of the appointment of the first French admiral; and the *Amiral de la Mer du Roy d'Angleterre* is first mentioned in records of the year 1297.

ADMIRALTY, BOARD OF. This is the department of the Commissioners for executing the office of Lord High Admiral of the United Kingdom—popularly known as the Lords of the Admiralty. From the year 1405 there is an uninterrupted series of lord high admirals of England, the office being always held by an individual, till the 20th November, 1632, when it was for the first time put in commission; the commissioners were all great officers of state. The title of lord high admiral has only been conferred on an individual on very rare occasions since—the last being in 1827-28, when it was borne for about sixteen months by the Duke of Clarence, afterwards King William IV.

The Board of Admiralty now consists of a first lord, three naval lords, and two civil lords, one of the latter of whom must possess special professional qualifications. There are also a parliamentary secretary, a naval secretary, and a controller. The salaries of these various officers, according to the Navy Estimates for 1885-86, were as follows:—

First Lord (with a house), . . .	£1,500
First Naval Lord (with a house), . . .	1,500
Second Naval Lord (inclusive of allowance for residence), . . .	1,200
Junior Naval Lord (ditto), . . .	1,200
Civil Lord, . . .	2,000
Civil Lord (Parliamentary), . . .	1,000
Parliamentary Secretary, . . .	2,000
Naval Secretary (inclusive of £200 allowance for residence), . . .	1,700
Controller (ditto), . . .	1,700

ADMIRALTY CHARTS are prepared and issued by the hydrographical department of the Admiralty, and contain the results of coast and other surveys in various parts of the world. The expense of these surveys is

defrayed from the Admiralty vote, but the cost is, to some extent, repaid by the sale of the charts. Similar charts are prepared and sold by the naval departments of other European nations, and by that of the United States.

ADMIRALTY COURT, a court in which a judge formerly sat as deputy of the lord high admiral for the disposal chiefly of maritime matters. From the days of Edward III. it exercised most extensive jurisdiction, not only in civil, but in criminal proceedings, for offences committed on the high seas. Its very tardy, cumbersome, costly, quaint, and old-fashioned procedure was improved by statute in 1861.

The jurisdiction of the court was both legal and equitable, and was exercised in matters of seamen's and masters' wages, salvage, towage, pilotage, necessities furnished to a foreign ship, damage by collision of vessels and bottomry; to enable a sole owner to regain possession of his ship, and to protect a dissentient part-owner in the case of the loss of a vessel under the management of his co-partners, by enforcing them to give him security. The Admiralty Court also adjudicated upon claims by owners of derelict vessels and cargoes; also in spoliation or piracy. It had jurisdiction in the case of an assault committed by the master of a vessel upon the seamen or passengers. It punished masters for hoisting illegal colours, for negligence in saluting one of her Majesty's ships, and also had the power of inflicting a fine on contumacious sailors in its court. By the 24 and 25 Vict. c. 10 (1861), the jurisdiction of the court was extended to all claims for building, equipping, or repairing ships, if the ship at the time of the institution of the suit be under arrest in the court; to necessities supplied a ship elsewhere than in the port to which she belongs; to damage to cargo in certain cases, to all claims for damage done by any ship, and to all questions between owners.

The powers of the court, in short, included almost everything connected with the rights and wrongs of the mercantile marine. The modes in which this very extensive jurisdiction of the Admiralty Court was exercised were called *in rem* and *in personam*—the one being a proceeding against the ship, cargo, or freight, and the other against the defendant in person; and the court had power, as a preliminary, to seize the subject-matter, and keep it under arrest till the suit was determined.

The jurisdiction of the Admiralty Court extended, it will be perceived, to many matters which might fitly have been determined by other tribunals, and various devices were resorted to in order to get through the vast mass of litigation that occasionally choked the court, such as empowering the Dean of Arches to sit as assistant, or in place of the judge, &c. Having an equity jurisdiction the same anomaly was often exhibited in Admiralty causes as between the Chancery and Common Law Courts, pointed out in our articles on **EQUITY** and **JUDICATURE ACT**; and a ship which had been cast in damages by a judge and jury might be held perfectly innocent in the Court of Admiralty, or *vice versa*.

The most satisfactory solution of the whole matter, however, was attained by the Judicature Act of 1875, which entirely abolished the special individuality of the court, and combined it with the Probate and Divorce Court as one of the divisions of the High Court of Justice established by the Act. By this course it became possible to distribute much of the work formerly concentrated in the Admiralty Court amongst other divisions of the High Court. There were, however, numerous rules and orders which had been made in adaptation to the special business of both the Probate and Divorce and the Admiralty Courts; the peculiar jurisdiction of those courts, in fact, necessitated solecisms in pleading and procedure which it was undesirable to interfere with. The Act therefore directed that in the new Divisional Court these rules and orders should

remain and be in force. The Act also provided that certain tribunals—such as the Mayor's Court, London; the Passage Court, Liverpool; the Tolzie Court, Bristol; and other inferior courts—might, by order in council, exercise jurisdiction in Admiralty cases, and do all that the High Court could do in the same matters. The amount, however, which may be claimed or awarded in these inferior courts is limited, and should a claimant in an Admiralty suit seek to recover more he must have his case transferred to the superior court.

The Court of Admiralty for Scotland was abolished by 1 Win. IV. c. 69. The cases formerly brought before this court are now prosecuted in the Court of Session, or in that of the sheriff, in the same way as ordinary civil causes. The Court of Justiciary has become the tribunal for the decision of the more important maritime offences. The inferior jurisdictions not dependent on the High Court of Admiralty were not abolished by the above act. (Burton's "Laws of Scotland.")

By s. 108 in the Corporations Reform Act (5 & 6 Win. IV. c. 76) all chartered Admiralty jurisdictions were abolished; but that of the Cinque Ports, attached to the office of lord warden, was expressly reserved. In several of our colonies there are courts of vice-admiralty.

From the Probate, Divorce, and Admiralty divisions of the High Court in England, appeals lie to the Court of Appeal, established by the Appellate Jurisdiction Act, 1876. Previously appeals were to the Privy Council.

ADMIRALTY DROITS. Derelict ships and other property picked up at sea by British vessels, if not claimed, are deemed droits of admiralty, and were formerly the perquisites of the lord high admiral of England, an office at one time held by King William IV. when duke of Clarence, but which was subsequently abolished. By the Merchant Shipping Act, 1854, the collection of these droits was placed under the control of the Board of Trade, by whom all the proceeds are now paid into the public exchequer. Seizures of property belonging to the enemy on the breaking out of hostilities are likewise deemed droits of admiralty.

ADMIRALTY ISLAND, on the N.W. coast of North America, belonging to the United States, is about 90 miles long, and in some parts 25 wide. It was circumnavigated by Vancouver. It is well wooded, and has numerous good bays.

ADMIRALTY ISLANDS consist of one large island and about forty smaller ones. They lie to the north-east of New Guinea, between 2° and 3° S. lat., and 146° 18' and 147° 40' E. lon.; and were discovered by the Dutch in 1616. The largest is about 50 miles long, and, like most of them, principally covered with cocoa-nut trees. The inhabitants are well made, of a dark colour, with frizzled hair, and go naked.

ADMON, one of the most celebrated engravers of gems of Greece. Although no date is known in connection with him, the many excellent works of his which are known point to the best period of art.

ADONIS. A youth so beautiful that his name has become almost a synonym for youthful manly beauty. He was the son of Myrrha, who at her own prayer, when pursued by her father for a crime to which she had been urged by the goddess Aphrodite, was turned into the bush which bore her name ever after, and, tree though she now was, bore Adonis. The tears of Myrrha thickened into the fragrant myrrh gum. Adonis avenged his mother, for Aphrodite herself fell in love with him as he grew up. He was passionately fond of hunting, and eventually met his death from the fury of a wild boar which he had wounded, and which turned upon him. Aphrodite, hearing his groans, hastened to her dying lover, and sprinkled nectar on his blood, so that the flowers sprung up which bear his

name. Yielding to her lament, Zeus allowed Adonis to return to earth for six months in the year. The other six months he spent in Hades with Persephone, who had also become enamoured of him. In Shakspeare's "Venus and Adonis" the youth is made to appear reluctant, and the myth is otherwise altered from its classical form to suit the poet's purposes.

Among the Greeks a yearly festival was held in honour of Adonis, similar to that which prevailed in Syria, from which place it had been introduced. In both countries the festival was divided into two parts—the first one of mourning and lamentation for Adonis dead, and the second of gladness and rejoicing for Adonis who had risen again. The myth is of Phœnician origin, and evidently has reference to the apparent death of nature in winter and its revival again in spring, under the fructifying influences represented by Aphrodite. The Phœnician Adon (whence Adonis) was the sun-god or king of heaven.

The worship of the Tammuz referred to in the book of the prophet Ezekiel, chap. viii. 14, is generally believed to be the same as the worship of Adonis. It is thus described by Milton:—

"Thammuz came next behind,
Whose annual wound in Lebanon allured
The Syrian damsels to lament his fate
In amorous ditties all a summer's day;
While smooth Adonis from his native rock
Ran purple to the sea, supposed with blood
Of Thammuz yearly wounded. The love tale
Infected Sion's daughters with like heat;
Whose wanton passions in the sacred porch
Ezekiel saw, when, by the vision led,
His eye survey'd the dark idolatries
Of alienated Judah."—*Paradise Lost*, Book I.

ADONIS, in botany, is a genus of plants belonging to the natural order RANUNCULACEÆ, and containing many species of very great beauty. The name is merely poetical. Adonis is distinguished from Ranunculus by the want of a little scale at the base of the petals, and from other genera of the order by the numerous hard, dry, sharp-pointed grains (*achenes*) of which its fruit consists.

Of the perennial kinds, *Adonis vernalis*, which is common in gardens in England, is found abundantly in a wild state on all the mountains of middle Europe. Its flowers have from ten to twelve petals of a yellow colour, and of a brilliancy which is rendered the more dazzling by the deep green tuft of finely divided leaves among which they expand.

Adonis autumnalis, or Pheasant's Eye, is the only species found in England, and that but rarely. It grows in corn-fields, and is of a deep crimson colour.

ADOPTION CONTROVERSY. In the eighth century Elipandus, archbishop of Toledo, and Felix, bishop of Urgel, maintained that although Christ might be called the Son of God in respect of his divine nature, yet in his human nature he could only be supposed to be so by adoption. The idea spread into the Frankish empire, but the opinion was declared to be heretical at the synods of Ratson and Frankfort. In later times the same idea was held by Denis Scotus, Vasquez the Jesuit, and Calixtus, a Protestant theologian.

ADOPTION (from the Latin *adoptio*). By the old Roman law the relation of father and son differed little from that of master and slave. Hence, if a person wished to adopt the son of another, the natural father transferred (manipulated) the boy to him by a formal sale before a competent magistrate, such as the prætor at Rome, and in the provinces before the governor. The father thus conveyed all his paternal rights, and the child from that moment became in all legal respects the child of the adoptive father. If the person to be adopted was his own master (*sui juris*), the mode of proceeding was by a legislative act of the people in the *comitia curiata*. This was

called *adrogatio*, from *rogare*, to propose a law. In the case of *adrogatio*, it was required that the adoptive father should have no children, and that he should have no reasonable hopes of any. In either case the adopted child became subject to the authority of his new father; passed into his family, name, and sacred rites; and was capable of succeeding to his property.

Women could not adopt a child, for by adoption the adopted person came into the power, as it was expressed, of the adopter; and as a woman had not the parental power over her own children, she could not obtain it over those of another by any form of proceeding. Under the emperors it became the practice to effect *adrogatio* by an imperial rescript, but this practice was not introduced till after the time of Antoninus Pius (A.D. 138-161).

There was also adoption by testament. C. Julius Cæsar, the dictator, thus adopted his great-nephew Octavius, who was thenceforth called Cains Julius Cæsar Octavianus, until he received the appellation of Augustus, by which he is generally known. But this adoption by testament was not a proper adoption, and Augustus had his testamentary adoption confirmed by a *lex curiata*.

The legislation of Justinian ("Inst." i. 11) altered the old law of adoption in several respects. It declares that there are two kinds of adoption: one called *adrogatio*, when by a rescript of the emperor (*principali rescripto*) a person adopts another who is free from parental control; the other when by the authority of the magistrate (*imperio magistratus*) he who is under the control of his parent is made over by that parent to another person, and adopted by him either as his son, his grandson, or a relation in any inferior degree. Females also might be adopted in the same manner. But when a man gave his child to be adopted by a stranger, none of the parental authority passed from the natural to the adoptive father; the only effect was that the child succeeded to the inheritance of the latter if he died intestate. It was only when the adopter was the child's paternal or maternal grandfather, or otherwise so related to him as that the natural law (*naturalia jura*) concurred with that of adoption, that the new connection became in all respects the same with the original one. It was also declared that the adopter should in all cases be at least eighteen years older than the person whom he adopted. Women who had lost their own children by death might, by the indulgence of the emperor, receive those of others in their place.

Adoption was no part of the old German law; it was introduced into Germany with the Roman law in the latter part of the middle ages. The general rules concerning adoption in Germany are the same, but there are some variations established by the law of the several states.

The French law of adoption is contained in the eighth title of the first book of the "Code Civil." The following are its principal provisions:—Adoption is only permitted to persons above the age of fifty, who have neither children nor other legitimate descendants, and are at least fifteen years older than the individual adopted. It can only be exercised in favour of one who has been an object of the adopter's constant care for at least six years during minority, or of one who has saved the life of the adopter in battle, from fire, or from drowning. In the latter cases the only restriction respecting the age of the parties is, that the adopter shall be older than the adopted, and shall have attained his majority, or his twenty-first year, and if married, that his wife be a consenting party. In every case the party adopted must be of the age of twenty-one. The form is for the two parties to present themselves before the justice of the peace (*juge de paix*) for the place where the adopter resides, and in his presence to pass an act of mutual consent; after which the transaction, before being accounted valid, must be approved of by the tribunal

of first instance within whose jurisdiction the domicile of the adopter is. The adopted takes the name of the adopter in addition to his own; and no marriage can take place between the adopter and either the adopted or his descendants, or between two adopted children of the same individual, or between the adopted and any child who may be afterwards born to the adopter, or between the one party and the wife of the other. The adopted acquires no right of succession to the property of any relations of the adopter; but in regard to the property of the adopter himself, it is declared that he shall have precisely the same rights with a child born in wedlock, even although there should be other children born in wedlock after his adoption. It has been decided in the French courts that aliens cannot be adopted.

Adoption is still practised both among the Turks and among other Eastern nations. There is no adoption in the English or Scotch systems of law, but patrimonial benefits may be conferred by deed, and the law provides means whereby anyone is enabled to assume the name, arms, and other distinguishing characteristics of a person who does not belong to his family—an assumption often required as a condition of inheritance.

ADOUR', called by the Romans *Aturus*, a river in France which rises in the department of Hautes Pyrénées. Its course is first in a northerly direction, past the town of Bagnères-de-Bigorre; then west, and finally south-west, passing Taubes, Aire, St. Séver (where it becomes navigable), Dax, and Bayonne. The whole length of the river is about 190 miles. Many streams from the Pyrenees, as the Gabas, Luy de France, Luy de Béarn, Gave de Pau, and the Bidouze, fall into the Adour on the left bank; the Midouze, and others, on the right. The current is usually rapid, and the melting of the snows on the Pyrenees sometimes causes inundations. The Adour falls into the Bay of Biscay, about 3 miles below Bayonne. It has a bar at its mouth, upon which, at ebb tide, there is sometimes less than 3 feet water.

ADO'WA, one of the chief places in Abyssinia, in the kingdom of Tigré (of which it is the capital), lying on the route between Massowah and Gondar. It is partly on the side and partly at the foot of a hill, an uncommon occurrence in Tigré, where most of the towns are on eminences. The houses are all of a conical form, and arranged pretty regularly in streets. The town is well supplied with water from some rivulets which fall into the Mareb, and grapes grow well in the gardens. Adowa, from its position, is the great mart between the coast and the interior provinces, and carries on a considerable trade, which is mostly in the hands of Mohammedan merchants. The chief manufactures are coarse and fine cotton cloths, made both of native cotton from the low lands on the Takkazie, and from cotton imported through Massowah, on the coast of the Red Sea; the imports and exports are very various, but the most important are ivory, gold, and slaves. The population is about 8000.

AD POPULUM. See **AD ROMINEM.**

A'DRIA, formerly *Hadria* or *Atria*, one of the most ancient cities of Europe, situated between the mouths of the Po and the Adigé. Under the Roman emperors it was a seaport town, with an extensive trade on the Adriatic, to which it gave its name, and was a station for the Roman fleet. At a later period, owing to neglect and the operation of physical causes, Adria became joined to the mainland, from which it was previously detached, and it is now 16 miles from the coast—the land having gradually encroached upon the sea through the deposits of mud from the Po and the Adigé. Adria, though in a state of decay, was never totally destroyed. After many vicissitudes the new town by degrees arose out of the ruins of the old city, a great part of which had been long before

buried under the successive alluvions. Its remains lie to the south of the present town towards Ravennano, where the old massive walls, and the ruins of an amphitheatre, baths, aqueducts, mosaic pavements, and other Etruscan and Roman antiquities, have been found many feet below the surface. The present town of Adria is situated on the Castagnaro, a branch of the Adigé, in the Italian province of Rovigo. It has 10,000 inhabitants, and is a bishop's see.

A'DRIAN I., Pope, born at Rome, succeeded Stephen III. in 772. Like his predecessor, he had to struggle against the power of the Longobards, who had invaded the provinces bestowed by Pepin, king of the Franks, on the Roman see. Adrian applied to Charlemagne for assistance. The king of the Franks crossed the Alps by the way of Susa, defeated Desiderius, king of the Longobards, and overthrew their kingdom in Italy, in 774. Charlemagne then renewed the grant of the provinces bestowed on the Roman see by Pepin. Adrian died, after a pontificate of nearly twenty-four years, on Christmas-day, 795. He was a man of talent and dexterity, and succeeded in gaining and preserving the friendship of the greatest sovereign of his time. He also used his influence for the security and prosperity of the people of Rome, and its duchy or territory, without, at the same time, neglecting the spiritual interests of his see.

ADRIAN II., born at Rome, succeeded Nicholas I. in the papal chair in 867. It was during Adrian's pontificate that Photius, patriarch of Constantinople, withdrew from the Church of Rome, from which time dates the schism between the Greek and Latin churches, which continues to the present time. Adrian died in 872, and was succeeded by John VIII.

ADRIAN IV., whose name was Nicholas Breakspere, succeeded Anastasius IV. in 1154, and is the only Englishman who has occupied the Papal chair. At the time of his election to the Papal chair, Rome was in a very disturbed state. Arnaldo of Brescia, a monk and a disciple of Abelard, had begun to preach a reform in the church as early as 1139, but being driven out of Rome by Pope Innocent II. had taken refuge at Zürich. In 1143, however, he was recalled by the Roman people, who had revolted against Innocent, and had proclaimed a Roman republic, which Arnaldo contributed to constitute. Arnaldo, who was an eloquent man, strongly condemned the temporalities of the church, and wished to restrict the pope's office to mere spiritual matters. Several successive popes, Celestine II., Lucius II., and Eugenius III., kept up a desultory struggle against this popular reformer, whose adherents occasionally committed many acts of violence. Adrian IV., after his election, placed Rome under interdict on account of these disorders, and caused all religious services to cease; which measure led the citizens to banish Arnaldo, who took refuge with some barons of Campania. Frederick of Hohenstauffen, known by the name of Barbarossa, had lately been elected emperor by the German Diet, and was on his way to Rome to be crowned. The pope's legates met him on the road, and demanded that the heretic Arnaldo should be given up by the Viscount of Campania, in order to be tried. His offence had been furiously condemned as political heresy. Arnaldo was brought to Rome, and delivered to the prefect of the city, by whose sentence he was hanged, his body burnt, and the ashes scattered to the winds, in 1155. Meantime Frederick approached Rome with his army. Adrian and the emperor disputed as to the ceremonies of his reception, but after mutual concessions Frederick proceeded toward Rome. The senate and the people made a more determined opposition to the claims of the emperor to dictate laws to them, and the Romans sallied out and attacked the German soldiers unawares. A general battle took place, and

continued with great slaughter on both sides till night separated the combatants. The city continuing in a disturbed state, both the pope and the emperor withdrew to Tivoli, whence Frederick returned towards Lombardy. Disputes of a more serious character than those of ceremonial continued between the pope and the emperor, out of which arose that spirit of bitter hostility between the popes and the house of Hohenstauffen which lasted until the utter extinction of the latter. But the seeds only were sown in Adrian's time. He died in the beginning of September, 1159, and was succeeded by Alexander III. It was by Adrian IV. that the sovereignty of Ireland was conferred upon Henry II., on the curious mediæval assumption that all islands were placed by St. Peter under the pope.

ADRIAN VI., born at Utrecht in the Netherlands, of an obscure family, advanced himself by his talents to the post of vice-chancellor of the university of Louvain. The Emperor Maximilian chose him as preceptor to his grandson, afterwards Charles V. Ferdinand of Spain gave him the bishopric of Tortosa. After Ferdinand's death he was co-regent of Spain with Cardinal Ximenes. He was elected pope in 1522, after the death of Leo X., chiefly through the influence of Charles V., whose authority was then spreading over Italy. Adrian endeavoured to reform the numerous abuses of the court and clergy of Rome. He practised a severe economy, and lived frugally. By so doing he displeased the Romans, who had been accustomed to the luxury and prodigality of Leo. He died in September, 1523, and was succeeded by Clement VII.

ADRIANOPOLE, called *Edrench* by the Turks, the second city of European Turkey, and the capital of the province of Eastern Roumelia, is situated on the river Maritza, the ancient Hebrus (navigable for small craft as high as Adrianople), which is here joined by the Tundja and the Arda. It is 135 miles N.W. of Constantinople. It takes its name from the Roman emperor Hadrian, or Adrian, who restored and embellished it. From 1360 to 1453 it was the occasional residence of several of the Turkish sultans. In the campaign of 1829 the Russians advanced as far as Adrianople, and in January, 1878, the city surrendered to them without attempting to strike a blow. Its easy occupation demonstrated the utter prostration of the Turks, and led to the immediate signature of an armistice. Adrianople rises gently on the side of a small hill from the banks of the Maritza and Tundja. The streets of the town are narrow and irregular, but it is well provided with mosques, sixty in number, and with baths. One of the mosques, that of Sultan Mourad I., was once a Christian church, and another has a large quantity of porphyry in its construction; but the great boast of the town is the mosque of Selim II., built chiefly of materials brought from the ruins of Famagosta, in Cyprus. It consists of one great apartment like a theatre, terminating in a cupola, and has four regular minarets, to the highest balcony of which there is an ascent by 377 steps. From this one of the finest panoramas in the world extends over the broad and rich plain of the old Hebrus. The Eski-Serai, once the palace of the sultans, but now in decay, is another distinguished public building. An aqueduct supplies the baths, mosques, and fountains with water. Many traces of Roman building may be seen at Adrianople. It is the seat of a bishop of the Greek Church, and its trade is still considerable. The manufactures are silk, woollen, and cotton stuffs, saddles, and boots and shoes. Large quantities of roses are grown in the neighbourhood for the manufacture of the perfume known as "attar of roses;" and the well known dye "Turkey-red" is produced. The soil around is very fertile, and the best wines and wool of the country are obtained here. The number of inhabitants is about 160,000, of whom one-third are Greeks.

ADRIATIC SEA, sometimes called the *Gulf of Venice*, is a large bay of the Mediterranean, which extends from about 40° N. lat. to 45° 46' N. lat. in a direction from S.E. to N.W., between the coasts of Italy on the west, and of Albania, Dalmatia, Croatia, and Illyria on the east. Its length, from Cape Lenca to Trieste, is about 450 miles; its average width, between 90 and 100 miles. The most northern part, on the east coast, forms the Gulf of Trieste; and the north-west part is called the Gulf of Venice. The navigation of the Adriatic is easy and safe in summer, but in winter there is a prevalence of violent gales, from which the numerous islands on the Dalmatian coast afford excellent shelter. The Italian coast is, generally speaking, flat and marshy. The Adriatic Sea derives its name from the ancient town of Adria. Its waters are saltier than those of the Mediterranean, and the ebb and flow of the tides more noticeable. The only rivers of importance which flow into it are the Po and the Adigé.

ADULARIA, or Moonstone, is a beautiful crystal brought from Mount Adula, in the country of the Grisons, in Switzerland, and also from Ceylon. It is a very pure limpid variety of felspar, and is composed of 64 per cent. of silica, 20 of alumina, 2 of lime, and 14 of potash. A very fine specimen has been sold for as much as £30. It is rather soft for cutting, but looks well with either rubies or emeralds.

ADULE, the ancient name of Zulla or Thulla, a small place situated in a recess of Annesley Bay, on the coast of Abyssinia. Adule was the port of Axum, and some ruins in the neighbourhood of Zulla would indicate that it was a place of considerable importance.

ADULTERATION (from the Latin *adulteratio*) is the use of ingredients in the production of any article which are cheaper and not so good, or which are not considered so desirable by the consumer as other or genuine ingredients for which they are substituted. In Paris, malpractices connected with the adulteration of food are investigated by the Conseil de Salubrité, acting under the authority of the prefect of police. For many years, unless the general health or public revenue was likely to suffer from the practice, the law of this country did not generally consider adulteration as a serious offence, but relied apparently on its being corrected by the discrimination and good sense of the public. Where the interests of the revenue are concerned, strict regulations have always been resorted to in order to prevent adulteration; and tobacco manufacturers are liable to exceedingly severe penalties for having in their possession various enumerated articles capable of being used as a substitute for or to increase the weight of tobacco or snuff; and brewers and retailers of beer and ale are also prohibited, under heavy penalties, from having certain articles on their premises.

The practice of fraudulently adulterating food, drink, and drugs had, however, become so common among certain classes of tradesmen, that in 1872 an Act, entitled "An Act to amend the Law for the Prevention of Adulteration of Food and Drink and Drugs," was passed. This was repealed by another Act, passed in 1875 (which was slightly amended in 1879), of which the chief provisions are, that the term "food" shall include every article used for food or drink by man, other than drugs or water, and drugs comprise medicine for internal and external use. The Act prohibits the mixing of injurious ingredients and the selling of the same under heavy penalties, with exemption in case of proof of absence of knowledge. It is on this latter point that the Act of 1875 chiefly differs from that of 1872. Formerly, it was sufficient to show that an article was adulterated, and many shopkeepers were fined for selling commodities as they received them. It is now provided that if the defendant in any prosecution proves to the satisfaction of the court that he purchased the article

in question as the same in nature, substance, and quality as that demanded of him by the prosecutor, "and with a written warranty to that effect;" and that he sold it in the same state as when he purchased it, he shall be discharged from the prosecution, but shall be liable to pay the costs incurred, unless he has given due notice that he will rely upon the above defence. A distinction is made in the 1875 Act between an article used for purposes of adulteration which is injurious to health, and one which is not, and which was not used fraudulently to conceal the bulk or the inferior quality of the article. No person is, however, to abstract any part of an article before sale and sell it without notice.

In the metropolis, the commissioners of sewers for the city and the vestries and district boards, the courts of quarter sessions in the counties, and in the boroughs the town councillors, may appoint competent salaried analysts, who are to keep a watch over the food, drink, and drugs offered for sale within the districts to which they belong. Medical officers of health, inspectors of nuisances, of markets, or of weights and measures, or any police constable acting under the direction and at the cost of the local authority, are authorized to procure and submit samples of food, drink, and drugs suspected to be impure for analysis by the officials referred to; and if adulteration be discovered, they are to prosecute the guilty parties in the magisterial courts. A tradesman refusing to sell an article for analysis is liable to a penalty of £10. Any purchaser, on paying 10s. 6d., can also have an article analyzed. A certificate thus obtained may be used in evidence against the parties accused. To secure tradesmen against vexatious proceedings, the onus of proving that the article alleged to be adulterated was delivered to the analyst in the same condition as when received from the seller, in all cases lies with the inspectors, who are to carefully seal up and preserve a portion of the sample before analysis is made. Since 1876 tea has been examined by the customs officers on importation, and when found to be unfit for human food is forfeited and destroyed.

The Licensing Act, passed in 1872, contained special clauses against the adulteration of wines, spirits, and beer, but these were repealed by the amended Licensing Act of 1871, and offences under this head are now dealt with under the general Adulteration Act.

The most important clause in the Adulteration Amendment Act of 1879 related to the question as to how far spirits might be weakened with water without becoming legally adulterated. Section 6 provides that in determining whether spirits when mixed with water are or are not adulterated, "it shall be a good defence to prove that such admixture has not reduced the spirit more than twenty-five degrees under proof for brandy, whisky, or rum, or thirty-five degrees under proof for gin."

ADULTERY (from the Latin *adulterium*), according to English law, is the sexual connection of any man with another man's wife, or of a married man with an unmarried woman.

Adultery was punished by the Jewish law with death; but the adultery which by the Mosaic law constituted a capital crime was only the sexual connection of a wife with any other man than her husband. By the Athenian law, the husband might kill the adulterer, if he detected him in the act.

By the Romans adultery was defined to be "sexual intercourse with another man's wife." It was adultery whether the male was married or not; but the sexual connection of any man with a woman who was not married was not adultery. The Julia Lex, passed about B.C. 17, allowed the father, whether the natural or adoptive father, to kill the adulterer and adulteress in certain cases which were laid down by law; the husband also could in certain

cases kill the adulterer when he caught him in the act, but not the wife. Sixty days were allowed for the husband or the father, in whose power the adulteress was, for commencing legal proceedings. After the sixty days were expired, any other person might accuse the adulteress. A wife convicted of adultery lost half of her dos, and the third part of any other property that she had, and was banished (relegata) to some miserable island. [See MARITAL, ROMAN.] The adulterer lost half of his property, and was also banished. A constitution of Constantine ("Cod." ix. tit. 30) made adultery a capital offence in the male. Justinian ("Novel." 131, c. 10) added confinement in a convent as the punishment of the adulteress, after she had been whipped.

By the canon law, adultery is defined to be the violation of conjugal fidelity; and the incontinence of the wife and husband is now considered as equally criminal in most Christian countries.

During the Commonwealth, adultery, in either sex, was made a capital felony in England (Seibel's "Acts," part ii. p. 121), but at the Restoration this law was discontinued. Before the establishment of the Court of Divorce, adultery came under the cognizance of the temporal courts in England as a private injury to the husband. A man might maintain an action against the seducer of his wife, in which he might recover damages as a compensation for the loss of her services. This was felt to be a scandal and a reproach to the law of England, and the action of *cruor con* was accordingly abolished by the 20 & 21 Viet. c. 85. A similar action, however, may even now be prosecuted in the Divorce Court.

At the present time any husband may petition the court for the dissolution of marriage on the single ground of his wife's adultery, but a wife cannot sue for a divorce on this ground alone. She is entitled to do so, however, if the crime has been coupled with cruelty, or desertion for two years and upwards, or if the husband has been guilty of incestuous adultery, rape, or unnatural crime. In 1870 an Act was passed permitting parties to suits for adultery to give evidence. See DIVORCE.

In Scotland, the Act 1563, c. 71, punished the notorious and habitual adulterer, man or woman, with death. The latest instance of sentence of death in Scotland for adultery is perhaps that of Margaret Thomson, 28th May, 1677. All the statutes on the subject have, according to the peculiar practice of Scotland, expired by long desuetude. In the seventeenth and the commencement of the eighteenth century, the church courts were very active in requiring the civil magistrate to adjudge in this offence; but this means of punishment was abolished by the 10th Anne, c. 7, s. 10, which prohibited civil magistrates from giving effect to ecclesiastical censures. Of late years the doctrine has been admitted by Scottish lawyers, that the seduction of a wife is a good ground for an action of damages; but such prosecutions are wholly unknown in practice. Adultery is a good ground for an action of divorce. (Hume "On Crimes," i. 452-458; Stair's "Institute," b. i. tit. 4, s. 7; Erskine's "Institute," b. i. tit. 6, s. 43.)

The French law ("Code Pénal," 324) makes it excusable homicide if the husband kills the wife and the adulterer in the act of adultery in his own house. The punishment of a woman convicted of adultery is imprisonment for not less than three months, and not exceeding two years; but the prosecution can only be instituted at the suit of the husband, and the sentence may be abated on his consenting to take back the wife (s. 337). The paramour of a wife convicted of adultery is liable to imprisonment for not less than three months, or for a period not exceeding two years; and to a penalty of not less than 100 francs, or not exceeding 2000 francs (s. 338).

AD VALOREM (Latin, according to the value).

This term is chiefly used in connection with the payment of excise or customs duties—the amount of the duty being a certain percentage of the value of the goods. There are now no *ad valorem* duties in the United Kingdom.

ADVENT, literally the approach or coming, is the space of four weeks preceding Christmas, appointed in the English and other Christian churches to be kept holy in celebration of the approach of the festival of Christ's nativity. The first Sunday in Advent, commonly called Advent Sunday, is now the Sunday, whether before or after, which falls nearest to St. Andrew's day (the 30th of November). The earliest possible date on which it can occur is the 24th of November. In the Greek church Advent commences on St. Martin's day (11th November), and thus lasts about six weeks.

ADVENTURE BAY is situated on the south-east coast of Australia, 43° 21' S. lat., 147° 20' E. lon. The anchorage is good and well sheltered, and the neighbouring shore furnishes abundance of wood and water. It was discovered by Captain Furneaux in 1773, and was named from his ship the *Adventure*, which formed part of the expedition under Captain Cook, who visited the bay in 1777. Captain Bligh visited here in 1788 and 1792.

ADVERB, the name given to a class of words employed with verbs, adjectives, &c., for the purpose of qualifying their meaning, just as the adjective is attached to substantives. In the English language a very large number of adverbs are distinguished by the termination *ly*, which in the Anglo-Saxon has the fuller form *lice*, and in German *lich*. Our own language possesses the same suffix in the form *like*, as *godlike*. These, however, and many other words in *ly*, are adjectives, as *manly*, *ugly*; and it is difficult to draw the line between these two classes, many words, especially in the older writers, being used indifferently for both. [See ADJECTIVE.] The word to which the adverbial suffix *ly* is added is generally an adjective, but occasionally the adjective has become obsolete in the present form of our language, and must be sought in the Anglo-Saxon. Thus *early* is derived from the Anglo-Saxon *aer*, which indeed still appears in the poetical forms *ere*, and the superlative *erst*. But though the termination *ly* is derived from the Teutonic portion of our language, it has been applied most freely to adjectives of Latin origin, as *publicly*, *privately*; and with these may be classed the adverbs from adjectives in *ble*, as *horribly*, *agreeably*, in which the liquid belongs at once to the adjective and the suffix. A class of adverbs is formed by prefixing the old Saxon preposition *an* or *on* to nouns, in which a careless pronunciation afterwards left nothing but the vowel *a*, as *on foot*, now *a-foot*.

ADVERSA'RIA, among the ancients a kind of commonplace book, or journal, in which were inserted any remarkable occurrences. The term was first adopted by the Romans, because their commonplace books "*adversa'riae scriptis impleverunt*" contained various incidental remarks made by different parties.

ADVERTISEMENT (from the French *avertissement*, which properly signifies a giving notice, or the announcement of some fact or facts). In the English, Scotch, and Irish newspapers, and other periodical works, there are annually published several millions of announcements known by the name advertisement. The duty on a single advertisement was formerly 3*s.* 6*d.* in Great Britain, and 2*s.* 6*d.* in Ireland; but by 3 & 4 Wm. IV. c. 23, it was reduced to 1*s.* 6*d.* in Great Britain, and 1*s.* in Ireland. In the year previous to this reduction the total number of newspaper advertisements published in the United Kingdom was 921,943. With the reduction of the duty the number of advertisements nearly doubled. In 1853 the duty was repealed altogether—a measure which gave a great impetus to newspaper literature, and general satis-

faction to the commercial and advertising public; for it is now universally acknowledged that in our complicated state of society every facility should be given to the most effectual means of informing the public of new improvements, inventions, and other things calculated to promote the general advantage. After the abolition of the duty the size of many newspapers was much enlarged, to allow the insertion of the enormous increase in the number of advertisements, and hundreds of cheap newspapers were established which owe their existence entirely to the repeal. Advertisements generally supply the fund out of which newspapers are supported, as the price at which the newspaper is sold (especially the cheap ones) is insufficient to pay the cost of paper, printing, and management.

Public notification by means of advertisement is often enjoined by statute, as in the case of railway, road, and bridge acts, and also in connection with proceedings in bankruptcy, &c. In many other ways the legal effects of advertisements are also important.

("The History of Advertising, from the Earliest Times," by Henry Sampson: London, 1874.)

ADVOCATE (from the Latin *advocatus*). The origin of advocates in Rome was derived from an early institution, by which every head of a patrician house had a number of dependents, who looked up to him as a protector, and in return owed him certain obligations. This was the relation of patron and client (*patronus, cliens*). It was one of the principal and most ordinary duties of the patron to explain gratuitously the law to his client, and to assist him in his suits.

Though the word advocate is now frequently used to express a person conversant with the law, who manages a client's case in court, this is not the meaning of the Roman *advocatus*. The word *advocatus*, as its etymology implies (*advocare*, to call to one's aid), meant any person who gave another his aid in any business, as a witness, for instance, or otherwise. It was also used in a more restricted sense to signify a person who gave his advice or aid in the management of a cause; but the *advocatus* of the republican period was not the modern advocate. He who made the speech for plaintiff or defendant was termed *Orator* or *Patronus*. Ulpian, who wrote in the beginning of the third century A.D., defines *advocatus* to be one who assisted another in the conduct of a suit ("Dig." 50, tit. 13). Under the Empire indeed we find *advocatus* sometimes used as synonymous with *orator*.

In countries where the Roman law prevails in any degree, the pleaders in courts of justice are still called advocates, but their character and duties vary under different governments. See ADVOCATES, FACULTY OF; AVOCAT.

Advocates in English courts are usually termed COUNSEL; but in the ecclesiastical courts the law officer of the crown is called the Queen's Advocate, and takes precedence there.

The Lord Advocate, or Queen's Advocate, is the principal crown lawyer in Scotland. See ADVOCATE, LORD.

ADVOCATE, LORD, is the name given to the principal public prosecutor in Scotland. He is assisted by a solicitor-general and some junior counsel, generally four in number, who are termed Advocates-depute. He is understood to have the power of appearing as prosecutor in any court in Scotland where any person can be tried for an offence, or to appear in any action where the crown is interested; but it is very unusual for him to attend in the inferior courts, which have their respective public prosecutors, called procurators-fiscal, who act under his instructions. The procurator-fiscal generally makes the preliminary inquiries as to crimes committed in the district; and after transmitting the papers to the lord advocate, he, or one of his assistants, either directs the case to be prosecuted at his own instance before the superior court, or leaves it to the conduct of the prosecutor-fiscal in the inferior court.

When a private party prosecutes, it is the practice for him to obtain the concurrence of the lord advocate. The lord advocate sat in the Scottish Parliament in virtue of his office as one of the officers of state. He is usually in the commission of the peace. The lord advocate, like any other party to a cause, never acts as a magistrate in his own person, but obtains such warrants as he may require from the Court of Justiciary. He and his assistants are always members of the government of the day, and resign when there is a change of ministers—sometimes much to the detriment of the public business of the country. The lord advocate is virtually secretary of state for Scotland, and his duties in this capacity are very multifarious. His parliamentary duties involve the preparation and introduction of all government measures relating to Scotland.

ADVOCATES, FACULTY OF. The Faculty of Advocates in Edinburgh constitute the bar of Scotland. It consists of about 400 members, but only a small proportion are practising lawyers; and it is not unusual for country gentlemen to acquire the title of advocate. The members may plead before any court in Scotland where the intervention of counsel is not prohibited by statute, in the House of Lords, and in parliamentary committees. Their claim to act as counsel is generally admitted in the colonial courts. A candidate is examined in Justinian's "Institutes," and required to translate any passage in the "Pandects." He is also required to pass an examination in general scholarship, unless he has taken a university degree, or satisfies the Dean of the Faculty that he has attained such scholarship as is denoted by the British degree of M.A. After the lapse of a year he is examined in Scottish law, and must produce evidence of having attended the law classes at the Edinburgh University. Being admitted by ballot by those members of Faculty who attend the impugment, the candidate, on taking the oaths, receives an act of admission from the Court of Session. The expense of becoming a member of the Faculty, including stamp duty, subscription to the widows' fund, the subscription to the library, &c., amounts to about £350. The Faculty choose a dean or chairman by an annual vote. The Dean of Faculty and the two crown lawyers, the lord advocate and solicitor-general, are the only persons who take precedence at the Scottish bar, independent of seniority. The lord advocate and the solicitor-general are the only members of the Faculty who wear silk gowns and sit within the bar.

ADVOCATES' LIBRARY. The idea of establishing a library for the use of the Faculty of Advocates in Scotland, seems first to have been entertained a few years before the Revolution. The author and active promoter of the plan was Sir George Mackenzie, of Rosehaugh. The plan was adopted by the Faculty of Advocates in 1684 or 1685 according to one authority; in 1680 according to another. Although the Advocates' Library, strictly speaking, belonged to the Faculty of Advocates as an exclusive body, it still was early considered as a public library, and was open to the public. This characteristic has rendered the institution very popular, and at the same time promoted its increase. In the year 1700 the greater part of the collection was consumed by fire. In the eighth year of Queen Anne it obtained the privilege of receiving a copy of every new book. The library is by far the largest and also the most valuable in Scotland. In Great Britain there are only two—viz., the British Museum and the Bodleian—that outnumber it.

As to ease of access, there is no public institution in Great Britain, and very few in Europe, managed with greater liberality than the Advocates' Library. Any stranger arriving in Edinburgh is admitted without introduction; but some introduction is required for habitually resorting to and reading in the library.

ADVOCATION, in the law of Scotland, was the name of a process by which an action might be carried from an inferior to a superior court before final judgment in the former. It was abolished in 1868, a simple "appeal" being substituted.

ADVOCATUS DIABOLI (Latin, the devil's advocate). When a nunc is submitted for canonization in the Roman Catholic church an advocatus diaboli is appointed to urge everything possible against the proposal. The term is commonly used with reference to a person who brings forward strong accusations against another.

ADVOWSON is the right of presenting a fit person to the bishop, to be instituted to a benefice within the diocese, which has become vacant. The person who has this right is called the patron (*patronus, advocatus*) of the church, and the right is termed an advowson (*advocatio*), because the patron is bound to advocate or protect the rights of the church and of the incumbent whom he has presented.

The bishop may reject the individual presented to him, but the cause of rejection may be examined, at the instance either of the clergyman presented or of the patron, by process in the temporal courts.

The patron was originally the founder of a church or other ecclesiastical establishment, he who built the church, gave the ground for it, and endowed it with lands; and his heirs had the right of presentation. The bishop was the judge of the qualification of the person who was presented. (Du Cange, "Gloss." tit. "Advocatus," "Patrons.")

An advowson may be transferred by sale, by will, or otherwise, and is available to creditors in satisfaction of the debts of the patron. It may be aliened for ever, or for life, or for a term of years; or the owner may grant any number of successive rights of presentation on future vacancies. But, in order to prevent a corrupt presentation, the immediate right to present is not an object of sale when a vacancy has actually occurred; and a purchase of it during the mortal sickness of the incumbent is also prohibited.

An advowson which has been immemorially annexed to a manor is called an *advowson appendant*, and is transferable by any conveyance which will transfer the manor itself. It may, however, be detached from the manor, and is then termed *advowson in gross*.

Advowsons are further divided into *presentative*, *collative*, and *donative*. In the first of these, when the proprietor of an advowson exercises his patronage, three persons are concerned—the proprietor, the clergyman who is presented, and the bishop in whose diocese the living is situated, or the *patron*, the *clerk*, and the *ordinary*. The presentation is usually a writing addressed to the bishop, which states that the party presenting is the patron of a church which has become vacant, and requests the bishop to admit, institute, and induct a certain individual into that church, with all its rights and appurtenances. Twenty-eight days are allowed to the bishop for examining the competency of the candidate, and at the expiration of that time he is admitted and instituted to the benefice by formal words of institution read to him by the bishop from an instrument to which the episcopal seal is appended. A mandate is then issued to the archdeacon or other officer to *induct*, i.e. to put the new incumbent into the actual possession of the church; and his title as legal *parspn* is complete.

Sometimes two of the three characters of patron, clerk, and bishop (or ordinary) are united in one person. Thus the bishop may himself be the patron, in which case institution alone is necessary. The bishop is then said to *collate* the clergyman to the benefice, and the advowson is said to be *collative*.

If the clerk is the patron he cannot present himself,

but he may pray to be admitted by the bishop; or he may transfer to another the right of presentation before the vacancy occurs, and then procure himself to be presented.

In some advowsons the patrons have power to appoint an incumbent without the approbation of the bishop. These are called *donative* advowsons, because the patron exercises the direct privilege of *giving* his church to a clerk selected by himself.

If, upon the vacancy of a living, no successor, or an insufficient one, shall be presented, it is put under *sequestration* by the bishop, who provides for the spiritual wants of the parish by a temporary appointment, and secures the profits of the benefice, after deducting expenses, until another incumbent shall be duly inducted. After a vacancy of six months, occasioned by the default of the patron, the right to present *lapses* to the bishop himself. On a similar default by him, it devolves to the archbishop, and from him again to the crown. The period of six calendar months is allowed to pass in each case before the right is forfeited to the superior. In the case of a donative, the right never lapses by reason of a continued vacancy, but the patron is compellable to fill it.

When the incumbent of a living is promoted to a bishopric, it is thereby vacated, and the crown has a right to present to it, for that turn, in lieu of the proprietor of the advowson.

If a man marries a female patron, and a vacancy happens, he may present in the name of himself and wife.

Where the patron is a lunatic, the lord chancellor presents in his stead; and he often exercises his right in favour of some member of the lunatic's family. An infant may present to a living in his patronage, and his hand may be guided in signing the instrument.

Of the benefices in the Established Church of England 1114 are under the patronage of the crown; 2324, of the bishops; 938, deans and chapters; 770, the universities; 931, parochial clergy; and 7900, of lay patrons.

ADVOWSONS, VALUE OF.—The following rules give the *very highest value* of an advowson, and any purchaser should think twice before he gives as much as is found by them.

To find the value of the perpetual advowson of a living producing £1000 a year, the present incumbent being forty-five years of age, and money making 4 per cent., we must first find how many years' purchase the incumbent's life is worth, and here we recommend the use of the Government or Carlisle Tables. Taking the latter, we find the annuity on a life of forty-five, at 4 per cent., to be worth fourteen and one-tenth years' purchase; but at 4 per cent., any sum to be continued annually for ever is worth twenty-five years' purchase. The difference is ten and nine-tenths years' purchase, or for £1000 a year, £10,900, which is the value of the advowson.

In finding the value of the next presentation only, other things remaining the same, the seller will presume that the buyer means to make the best of his bargain by putting in the youngest life that the laws will allow, that is, one aged twenty-four. The value of an annuity on such a life, at 4 per cent., according to the Carlisle Tables, is seventeen and eight-tenths years' purchase. And as we are giving the highest possible value of the advowson, omitting no circumstance which can increase it, we will suppose the next incumbent to come into a year's profits of the living immediately on his taking possession. The rule is this:—Take 4 per cent. of the value of the present incumbent's life, or $14\frac{1}{10} \times .04$, which gives .564; subtract this from 1, which gives .436; divide by 1 increased by the rate per cent., or 1.04 , which gives .419; add one year's purchase to the presumed value of the next incumbent's life ($17\frac{8}{10}$), which gives $18\frac{8}{10}$; multiply this by the last result, .419, which gives $18\frac{8}{10} \times .419$, or 7.88

nearly—the number of years' purchase which the next presentation is now worth—which, if the living be £1000 a year, is £7880.

AD'YTUM (*ἄδυτον*), a Greek term signifying a place that may not be entered, is applied to the innermost and secret chamber of a temple. In the ancient Egyptian temple, the adytum is placed at the end of a series of propylæa, porticos, and vestibules, and surrounded by galleries and chambers, which afforded every facility for concealing the mysteries of the interior. There is no corresponding arrangement in the Greek and Roman temples, with one or two doubtful exceptions. The "most holy place," or the Sanctum Sanctorum (the holy of holies), was the adytum of the temple of Solomon at Jerusalem—a building which may reasonably be believed to have been constructed in the form and after the manner of the temples of the Egyptians.

ÆCID' IUM BERBER'IDIS (Barberry Blight) is the name given to the "wheat mildew" during one portion of its life-history. The leaves of the barberry are often found in the spring to be swollen and covered with yellowish spots. Each spot is an æcidium, which at maturity breaks through the surface of the leaf, and sheds its spores. These æcidium-spores only pass to the next stage of their existence, when they fall on the leaf or stem of a grass, e.g. on wheat. In this case they germinate; the thread-like outgrowths push their way through the openings of the stomata into the interior of the grass, and there live and grow at the expense of their host. In about a week from the time of germination long narrow reddish swellings may be seen on the grass, from which very short threads presently break forth, bearing spores (uredo-spores). These spores germinate again on grass during the summer, and at length, in the autumn, two-celled spores (telento-spores) are produced, which remain on the grass during the winter. This was formerly described as a distinct fungus, under the name of *Puccinia graminis*. In the spring the telento-spores put out threads, and at the ends of these are developed small spores, called *sporidia*, which only germinate on the surface of the leaves of the barberry. There they penetrate the epidermis-cells and germinate, the cycle being completed with the production of æcidia-fruits. Smaller spots than the æcidia occur scattered amongst them; these are called *spermogones*, but their function is not certainly known.

This is a good instance of what is known as "alternation of generations." There are here three generations, all different, and derived one from the other in regular order. Another feature to be noticed is, that one generation is developed only on one particular host, and the next on another quite distinct. As it is impossible to get rid of the mildew when it has once attacked the wheat, measures should be taken to prevent, as far as possible, its reappearance in the following year. Grass on the outskirts of the wheat-field should be cut down, not only to prevent the spreading of the uredo-spores, but to minimize the formation of the telento-spores, and their preservation till the following spring. Watch should be kept, too, against the development of æcidia.

ÆDILES, Roman magistrates, who are said to have been called *Ædiles* because they had the care of the temple (*ædes*) of Ceres. The *ædiles* were first appointed B.C. 494, and elected from the plebs or commonsalty; and at first they were the officers of the tribunes. These were the plebeian *ædiles*. The two *ædiles*, called *cursule*, were first elected B.C. 365 (Livy, vi. 42). The *cursule ædiles* had the higher rank; and they alone of the *ædiles* had authority to make general rules applicable to the administration of their office (Gaius, i. 6). It is not easy to distinguish the functions of the two classes of *ædiles*. Generally, they had the care of the temples, baths,

porticos, aqueducts, sewers, and roads of the city; and they presided at the religious celebrations, of which theatrical exhibitions formed an important part. Other duties were, inspection of markets, examination of weights and measures, and general regulation of business ("Dig." 21, tit. 1). The curule ædileship was the second in the series of honours through which the Roman candidate proceeded to the consulship. In B.C. 45 C. Julius Cæsar established two more plebeian ædiles, whose business was to look after the supply of corn. The office of ædile was known also in the municipal towns of Italy.

ÆGA'GRE (*Capra agâgrus*), a species of wild goat, or ibex, which inhabits, in troops, the mountains of Eastern Europe and of Persia, where it is called *paseng*. The great size of the horns of the ægagre, measuring sometimes 4 feet in length, gave rise to the belief that it employed them to break its fall in leaping from a height, but this idea has been now disproved. The body is of a grayish tint. The Oriental bezoar, or calcareous concretion, is sometimes found in its stomach, as in that of other ruminants. These stones were once supposed to possess medicinal virtues, and were in repute both in Europe and the East.

ÆGE'AN SEA. See ARCHIPELAGO, GRECIAN.

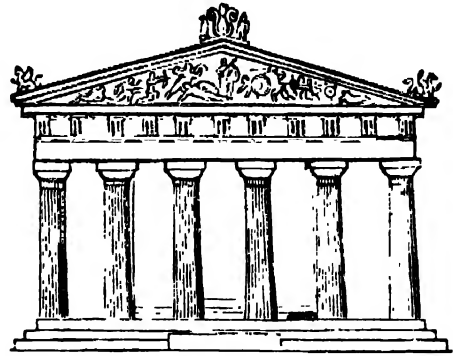
ÆGI'NA, a small island in the Gulf of Ægina, which retains its ancient name, and forms a part of the modern kingdom of Greece, being included in Attica and Bœotia.

The western part of the island is a stony plain, which, however, is very fertile, and produces corn in large quantities. The southern part of the island is occupied by Mount Oros; and on a ridge in the north-east, in a beautiful and striking position, are the ruins of an ancient temple, supposed to be that of Zeus (Jupiter) Panhellenius, separated by a narrow valley from the hill on which the modern town of Ægina stands. The site of the ancient town is shown, on the north-west coast, by the remains of two artificial harbours. The walls on the land side, which were about 10 feet thick, can be traced through their whole extent. The climate of Ægina is the most salubrious of any part of Greece. The modern town has a considerable trade, and a population of 7000.

Ægina was occupied by the Achæi (Homer, *Iliad*. ii. 562), and afterwards by Dorians from Argos. In B.C. 563 it traded with Egypt (Herodotus, ii. 178), and was one of the great emporiums of the Mediterranean. In B.C. 480 (Herodotus, vii. 147) there was an active trade in grain between the corn countries on the Black Sea and the Peloponnesus and Ægina. The island had at an early period a silver coinage, the common type on one side of which is a sea tortoise: a double drachma is engraved in Coins, Plate I. The people of Ægina took a brilliant part in the great naval fight of Salamis (B.C. 480), to which they sent thirty ships. After the Persian wars the old jealousy of Athens and Ægina was revived, and finally in B.C. 431 the Athenians took possession of the island and expelled the people (Thucydides, ii. 27). A remnant of them was restored by the Spartan Lysander at the close of the Peloponnesian War, B.C. 404; but Ægina never recovered its earlier importance.

The temple of Zeus Panhellenius, which was in ruins in the time of Cicero, was probably destroyed by an earthquake. It was of Greek Doric, and had a portico of six columns at each end, and ranges of twelve columns along each side, the columns on the angles being counted both in flank and in front. Internally it was divided into what may be termed nave and aisles, by two ranges of columns, the space between which was uncovered. The cella or body of the temple was a regular parallelogram, inclosed by four walls; access was given to the interior by doors in the cross-walls, under inner porticos formed by the longitudinal extension of the flank-walls, the projecting

shoulders of which are termed *antæ*; between these *antæ* two columns stand, thus forming at one end the *pronaos*, or front entrance, and at the other the *opisthodomus*, or hinder chamber, probably used as the treasure or storehouse. A kind of gallery was formed on the floor of the peristyle around the body of the temple, and this was raised by three deep steps from a nearly level platform called a *peribolus*, in the midst of which the temple stood; this was partly hewn out of the native rock, and



Front Elevation of the Temple of Ægina, as restored.

partly constructed, and a low wall or parapet girded it on all sides. The temple fronted east and west, the east being the entrance front, before which the *peribolus* extended itself more than 100 feet, while on the west it was not more than 50 feet wide. The extreme length in front, measured on the face of the lowest step of the regular stylobate, is 49 feet, and in flank 100 feet. Both the *tympana* were highly enriched with sculptures. The architecture of the Panhellenium indicates an earlier date than Pericles, possibly about the early part of the sixth century before Christ.

The subjoined sketch, made on the spot by W. Jenkins, architect, is a view of the temple in its present state. It is taken on the west front, looking eastward and northward; the walls are thrown down, though their site is not obliterated. The two columns in the foreground are all that remain of the west portico, and the



Ruins of the Temple of Ægina.

two couples which appear within the external peristyle are those of the *opisthodomus* and *pronaos*.

The sculptures which occupied the *tympana* of the pediments of the Panhellenium were, by a party of English and German travellers, discovered in May, 1811, buried under the ruins. They are now in the *Glyptothek*, or Sculpture Gallery, at Munich. The figures all wear that vacant smile so frequent in early Greek sculpture, to have abol-

ished which is one of the merits of PHIDIAS. One or two specimens will be found engraved among our Plates (article SCULPTURE, Plates I. and III.) Thorwaldsen was engaged to repair all the statues which were not so completely broken as to render reparation impossible. Restorations of the two pediments of the Panhellenium, with casts and imitations of the figures on the tympana, are in the British Museum.

ÆGIS, the name given (by metonymy) to the shield of Zeus; but really, as its name (*aiyis*, goat-skin) implies, the covering of the shield. Homer makes it the skin of the goat Amalthea, which suckled the infant Zeus (Jupiter), and describes it as being worn either over the shoulder as a protecting scarf or belt, or thrown over the shield. The head of Medusa (brought by PERSEUS) was in the middle, and the serpents of her hair made a fringe for the edges. Athena is often represented as wearing the ægis in her statues, as well as by the poets; but it is to her father Zeus that Homer applies the epithet "ægis-bearer."

In later times the ægis became the symbol of Divine protection, and in our own day we use such phrases as "throwing over such an one the ægis of the law," to express the protection of some supreme authority.

ÆGLE is a genus of plants belonging to the order **RUTACEÆ**, and very nearly related to the orange (*Citrus*), differing in not having its stamens united, and its leaves three-foliate. The fruit of *Ægle Marmelos* is the *bhel* of India, highly esteemed for flavour and fragrance. Many portions of the plant are used for medicinal purposes—the unripe fruit for dysentery and diarrhœa, a decoction of the leaves for asthma, and of the root and bark for hypochondriasis.

ÆLFRED. See ALFRED.

ÆLFRIC, a Saxon prelate, who, having entered the monastery of Abingdon in early life, became subsequently a priest in the cathedral of Winchester, abbot of St. Albans, bishop of Wilton, and finally archbishop of York. He was one of the most learned ecclesiastics of his age, and was distinguished by his earnest efforts for the diffusion of knowledge. He was the author of several important works, among which were a Saxon and Latin Glossary, a Treatise on the Old and New Testaments, and eighty Homilies in Saxon. He flourished at the latter end of the tenth and the beginning of the eleventh centuries.

ÆMILIUS PAULUS, LUCIUS, was the son of the consul of the same name, who fell in the battle near Cannæ (B.C. 216), when Lucius was still a boy. He rendered important services to the state, and enjoyed a large amount of public esteem and confidence, but did not attain the consulship until B.C. 182. During this and the following year he commanded an army in Liguria, and completely reduced the Ingauni, who have left their name in the maritime town of Albenga, formerly Albium Ingaunum. In 168 a second consulship, and with it the command against Perseus, king of Macedonia, was intrusted to Æmilius Paulus, who was now at least sixty years of age. Perseus was finally defeated by the Roman general in a battle near Pydna, in Macedonia. The king made his escape to the island of Samothrace, where he soon after fell into the hands of the conqueror. The date of the battle of Pydna has been fixed (by an eclipse) as the 22^d of June. After reducing Macedonia to the form of a Roman province, Æmilius proceeded to Epirus. Here, under the order of the senate, he delivered up to his army seventy towns, which had supported Perseus, with 150,000 of the inhabitants as slaves, and all their property as plunder. On his arrival in Rome, however, he found in this army, with whom he was far from popular, the chief opponents of his claim to a triumph. This honour he at last obtained, and for three successive days the magnificent procession wound through the streets of Rome. It

was the most splendid triumph Rome had yet seen. Æmilius lived eight years after his victory over Perseus, and he was censor, B.C. 164. At his death, B.C. 160, his two sons, who had been adopted into the families of Fabius and Scipio, honoured his memory by the exhibition of funeral games; and the "Adelphi" of Terence, the last comedy the poet wrote, was first acted on this occasion. The fact is attested by the inscription still prefixed to the play. Of these two sons Quintus (Q. Fab. Max. Æmilianus) served with great distinction in Spain and elsewhere, and Publius (P. Corn. Scipio Æmilianus) became the celebrated Africanus Minor. Æmilius found in his grateful friend, the historian Polybius, one willing and able to commemorate his virtues. The name is often spelt Paulus. (Livy, xxxiv.-xl.; Polybius, xviii.-xxxii.; Plutarch, "Æmilius Paulus.")

ÆNEAS, a Trojan prince, son of Anchises and the goddess Venus. According to Homer he commanded the Dardanians; and his name occurs frequently in the Iliad, but not in the first rank of heroes. He owes his celebrity to those stories which make him the reputed founder of the Roman empire in Italy, and is the hero of Virgil's *Æneid*. The chief traditions concerning Æneas and his settlement in Italy are stated in Niebuhr's "History of Rome" (Hare and Thirlwall's translation, vol. i. p. 176).

ÆNEID. See VIRGIL.

ÆOLIAN HARP, a charming musical instrument (so called from Æolus, god of the wind):—

"From which with airy flying fingers light,
Beyond each mortal touch the most refined,
The God of Winds drew sounds of deep delight,"

as Thomson beautifully says. Indeed the Æolian harp has always been a favourite source of inspiration with the poets—Coleridge's lines to it being possibly the finest. Its chords are so sweet and so perfectly in tune, they sway from high to low, and from soft to loud, in so enchanting a manner, and it seems so mysterious that such rich and ever-varying harmony should be produced by the unseen fingers of the wind, from strings, too, whose note is the same for all, that he must indeed be dead to the poetry of sound whose imagination is not stirred. To hear the Æolian harp to perfection, we must place it in an open window, and then draw down the sash upon it, choosing a window oblique to the direction of the wind. Sometimes it adds to the effect if we also open the door of the room. The air enters between the open cover of the instrument and its sound-board, and plays across the surface of the strings. Then,

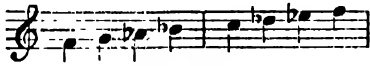
"By the desultory breeze caressed,
It pours forth sweet upbraiding."—Coleridge.

As its construction is quite simple, we add practical details. It may be about 3 feet long, or of such a length as fills the window opening, 5 or 6 inches broad, and 3 or 4 inches deep; a long thin narrow box of pine, with some sound holes (like a violin) on its upper surface. The ends must be of beech, one end supplied with about a dozen pins firmly driven in, the other with as many pianoforte tuning pins. Two narrow slips of hardwood, oak or beech (placed on the pine box, not on the beech ends), are now added, one near each end, athwart the box, to serve as bridges. Catgut strings are fastened to the hitch pins and stretched along the box, over the bridges, by means of the tuning pins. A cover, open at both sides, is supported about an inch above the strings. The strings should all be carefully tuned to perfect unison (the old directions to tune some in fifths with others are quite worthless), and to such a low pitch as will leave them tolerably slack, though not loose.

The strings being slack, vibrate readily in sections, the

number of which, and consequently the note given by the string, varies with the slightest variation of pressure of the wind. The scientific explanation of this must be sought elsewhere in this work, under ACOUSTICS, PARTIAL TONES, HARMONICS, &c.

ÆOLIAN MODE, in music, one of the ancient Greek modes or scales; our scale of F minor, with a minor seventh.



Ancient Æolian.

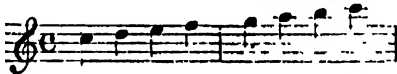
The hypo-Æolian (what we should call a dominant) was a similar scale on C, and the hyper-Æolian (our sub-dominant), on B♭. See GREEK MUSICAL SYSTEM.

In the ecclesiastical system of the middle ages Greek names were used for the church modes, although the tradition of Greek music had died out, and the scales were constructed on an altogether different plan. In this totally incorrect manner the church mode of A (the ninth) was called by the ignorant "learned men" of that time "Æolian." It happens by chance to have the same relative intervals as the true Greek Æolian—but reckoned from A as a key-note instead of from F.

The celebrated *Tonus Peregrinus* (used in Mozart's "Requiem") is written in the Ecclesiastical-Æolian mode.

Ecclesiastical (so-called) Æolian.

This was the authentic or hyper-Æolian of the middle ages; the plagal or hypo-Æolian began on the E below. The use of hyper (above) and hypo (below) is seen to be quite contrary to Greek order, and the relations to the key-note of the notes in the subjoined scale of the plagal will be found to differ altogether from those in its authentic.



It seems probable, however, that in actual use the key-notes of the authentic and of the plagal remained the same, but that the scale was differently arranged with regard to it. Thus, in our illustration, though the plagal mode starts on E, it may be considered as starting on the fifth, and A in this view would still remain the key-note. See MODES ECCLESIASTICAL, AUTHENTIC.

ÆOLIANS, one of the principal branches of the Greek nation, who originally dwelt in Thessaly, and who formed numerous settlements in the northern parts of Greece and west of Peloponnesus. In the eleventh century B.C., large numbers of them emigrated to Asia Minor, and formed colonies on the coast, extending from Cyzicus along the shores of the Hellespont and the Ægean to the river Caicus, and even the Hermus. There were twelve cities or states included in the older settlements in that tract of Asia Minor, on the Ægean, which was known in Greek geography by the name of Æolis, and formed part of the subsequent larger division of Mysia. They existed as independent states until they were conquered by the Persians. They afterwards formed a portion of the empire formed by Alexander, and ultimately became absorbed in the Roman empire. The name Æolic is often applied to a branch or dialect of the Greek language which approached nearest to the Doric as it was spoken in most parts of the Peloponnesus after the Dorian invasion, and which reached its highest perfection in the lyric poetry of Alcaeus and Sappho.

ÆOLIPYLE or **ÆOLIPILE**, an instrument made use of formerly in experimenting, and consisting of a hol-

low ball, with a small orifice in which a tube might be screwed. It served to boil water in, for the purpose of creating steam.

ÆON, a Greek word used to signify an age, a period of indefinite duration, or eternity. It occurs frequently in the New Testament, and has been brought into prominence in recent times by the controversies respecting the doctrine of future punishment. In the early church the word was used by the Gnostics to denote eternal beings which they believed had emanated from God before the beginning of time.

ÆPYOR'NIS is the name given by Professor Owen to an extinct bird of gigantic size, bones of which have been found in a recent formation in the island of Madagascar. Judging from the size of the remains, it must have been larger than an ostrich, and most probably belonged to the same group of birds—the STRUTHIONES. Its egg measures 3 feet round its longest circumference; the liquid contents would therefore have been equal to more than two gallons, or about 150 hen's eggs.

ÆRATED WATERS are effervescent beverages usually prepared by impregnating water with carbonic acid gas, and the addition of small quantities of saline matters or fruit syrups. The most common of these is the carbonic acid water generally spoken of as soda water, though it seldom contains any soda. In manufacturing this on a large scale the gas is prepared by the action of sulphuric acid on chalk in a lead chamber, and after being cleansed is forced with water into a very strong copper vessel, tinned inside, where the water becomes charged with the gas, and is drawn off into bottles. On a small scale, and for home use, the water is generally prepared in an apparatus termed a gasogene or seltzogene. This consists of two globes, generally of glass, covered by wire netting, as protection in case of breakage, and placed one above the other. In the upper globe are placed the materials for generating carbonic acid gas, generally consisting of powders made of bicarbonate of soda and tartaric acid. The lower globe is filled with water, and when, by tilting or turning, a small quantity of this enters the upper globe chemical action is set up, and the carbonic acid given off is absorbed by the water, which, when charged, can be drawn off at pleasure. It is frequently used for mixing with wine or spirits, and many non-alcoholic beverages are made by running the aerated water into glasses containing lime juice, sugar, or a little fruit syrup. True soda water is made by the addition of about 30 grains of sodium bicarbonate to each pint of the aerated water, and seltzer water by the addition of carbonate of soda and common salt.

There are also numerous aerated waters used for medicinal purposes, such as Carrara, chalybeate, lime, lithia, magnesian, potash, &c., which are prepared in a similar manner—the different salts, &c., being added to common aerated water in various proportions according to the strength required or the skill of the manufacturer. They form very useful vehicles for the administration of medicine, but should only be used under proper advice. At the present time, owing to the influence of the temperance movement and the desire for non-alcoholic beverages, new aerated waters are being constantly brought forward. Their composition is generally kept a secret by the manufacturers.

ÆRIAL IMAGES. This name is given to those images which are caused by the convergence of reflected or refracted rays of light, when they appear to be suspended in the air.

If a spectator place himself directly in front of a concave mirror, at greater distance from it than the centre of its curvature, the pencils of light diverging from points on that part of his person which is turned towards the mirror, and is not very far from its axis, will, after reflection,

converge to corresponding points between him and the mirror, and will constitute an inverted image of himself. The rays in each pencil, crossing one another at the image, and falling afterwards in a diverging state on the spectator's eye, will produce a vision of the image, faint, however, and indistinct; in these circumstances, also, it usually appears to be within or behind the mirror.

But, as the spectator approaches the mirror, the reflected rays which form the image meet at a greater distance from the mirror in its front; the eye at the same time, being nearer the image, receives pencils which are reflected from parts of the mirror at greater distances from the axis, so that the image appears both greater and more distinct; and if the mirror be at least 18 or 20 inches in diameter, the image of the spectator will be seen hanging in the air, in an inverted position, between himself and the mirror.

If, while the spectator is yet further from the mirror than the centre of curvature, he advance his hand towards the mirror, the hand of the image will seem to advance to meet it; and, at a certain place, which is the centre of the mirror's curvature, the hand and its image will appear to coincide.

If the spectator now advance towards the centre, the image will advance to meet him, but it will become indistinct, and at the centre will be entirely lost. Proceeding beyond the centre towards the mirror, the reflected pencils will converge to points beyond the centre in the opposite direction, that is, behind the spectator, and the rays of the pencils will enter the eye before they can unite to form the image; then the spectator will perceive the reflection of himself in the mirror in an erect position, and the figure will become more and more distinct as he approaches nearer to the mirror. See MINOR.

AERO-DYNAMICS signifies the science which treats of the motion of the air, or of the mechanical effects of air put in motion. In its widest sense it might be taken to include the effects of the motion of any gaseous substance or vapour; and even the properties of steam might be considered as a part of the science. We shall, however, confine ourselves to the explanation of a few general principles.

The air is an elastic fluid—that is, any portion of it can be confined in a smaller or expanded into a larger space than it usually occupies. In either case a force or pressure is to be overcome; the air itself resists compression; and the pressure of the superincumbent air is to be overcome before any expansion can take place. This pressure, in the ordinary state of the atmosphere, is estimated at about 15 lbs. avoirdupois on every square inch. See AIR.

As soon as we begin to move we feel, more or less, the resistance of the air. And since any body in moving through a fluid, as air, not only displaces a greater number of particles of the fluid in equal times, in proportion as it moves faster, but causes each particle to react against the body more powerfully in proportion as the latter, by moving faster, strikes it with greater force; it follows that the resistance of a fluid at rest against a body moving in it, or the resistance of the fluid in motion against a body at rest, varies with the square of the velocity of the body, or of the air; that is, if the velocity be suddenly made ten times as great, the resistance is made ten times ten, or a hundred times as great. And this is sufficiently near the truth, for practical purposes when the velocities are 800 or 900 feet in a second.

But one circumstance has been neglected. The successive particles of air which the moving body strikes, instead of being moved out of the way completely, are forced upon those in front, so that there is a condensation of air before the moving body; which condensation [see ACOUSTICS] is propagated onwards at the rate of about 1125 feet in a

second. Meanwhile the space through which the body moves, or has moved, is or has been entirely cleared of air; and though the air is forced with great rapidity into the vacant space, yet this is not done instantaneously. Therefore, when a body is in motion, there is an increase of the pressure before the body, and a diminution of that behind it, both which circumstances increase the resistance.

Let a ball move in any direction with a velocity less than 1000 feet per second; then, since the condensation in front is propagated quicker than the ball moves, the air in front may be considered as nearly in its natural state of density, and the motion of the ball will be retarded merely by the want of pressure behind on account of the partial vacuum there. But when the ball moves with a greater velocity (suppose 1700 feet per second) than that of sound (= 1125 feet per second), the space immediately behind it may be considered a complete vacuum, since by experiment it has been found that air rushes into a void space with a velocity of between 1300 and 1400 feet per second; and then the resistance will be much greater than that which would take place if it depended simply on the displacement of the particles of air and the force of their reaction in front. The resistance to an iron ball of 12 lbs. weight, moving at the rate of 25 feet per second, is equivalent to a pressure of half an ounce avoirdupois. If we increase 25 feet per second to 1700 feet per second, or multiply the first sixty-eight times, the square of which is 68×68 or 4624, we might, from the first part of this article, expect a resistance of 4624 half-ounces, or 144½ lbs.; instead of which it is found to be 433½ lbs. or three times the preceding. At a velocity of 1600 feet per second, the resistance was found to be more than twice that given by the theory.

The following well-known table, first given by Smeaton in the "Philosophical Transactions," and confirmed by recent experiments, shows, in pounds avoirdupois, the pressure which different winds will exert upon a square foot of surface exposed directly against them.

Velocity of wind.		Force on the square foot in pounds avoirdupois.	Character of the wind.
Miles per hour.	Feet per second.		
1	1.47	.005	Hardly perceptible.
2	2.93	.020	
3	4.10	.044	
4	5.87	.079	Gentle pleasant wind
5	7.33	.123	
10	14.67	.492	
15	22.00	1.107	Pleasant brisk gale.
20	29.34	1.968	
25	36.67	3.075	
30	44.01	4.429	High winds.
35	51.34	6.027	
40	58.68	7.873	
45	66.01	9.963	Very high.
50	73.35	12.300	
60	88.02	17.715	
80	117.36	31.490	Storm or tempest.
100	146.70	49.200	
			Great storm.
			Hurricane.
			Destructive hurricane.

AEROLITES, or meteoric stones, are bodies which have fallen upon the earth from the atmosphere, and are named from *ἀήρ* (*aēr*), atmosphere, and *λίθος* (*lithos*), a stone. The generic name of *luminous meteors* is now, however, more commonly adopted, and includes falling or shooting stars, bolides, and the like. The fall of stones from the atmosphere was known to the Greeks; but the first man of science in modern times who directed attention to the subject of aerolites was Chladni, a German

philosopher, who, in a tract published at Riga and Leipzig, in 1794, upon the mass of native iron found by Pallas in Siberia, maintained the credibility of the traditions of that and other stony bodies having fallen from the air. From that time greater attention than before was paid to the popular accounts of meteoric stones. In 1796 a stone was exhibited in London, weighing 56 lbs., which was said to have fallen in Yorkshire in December of the preceding year. In 1799 Sir Joseph Banks received a circumstantial account, accompanied by specimens, of a fall of stones from the atmosphere, which was said to have taken place near Benares in the preceding December; and as these specimens were nearly identical with the Yorkshire stone, incredulity began to give way. It was not, however, until the appearance of a paper by Howard, in the "Philosophical Transactions" for 1802, giving an account of his analysis of the Benares stone, that men of science declared their belief in the phenomenon.

A detailed description of one very remarkable shower of stones will illustrate the subject generally. On the 26th of April, 1803, at one o'clock in the afternoon, the sky being clear with the exception of a few light clouds, a ball of fire was observed in Normandy in many places far distant from each other—namely, Caen, Falaise, Alençon, Verneuil, and Pont Audemer—which moved rapidly from south-east to north-west; and about the same time, in the district of L'Aigle, loud explosions were heard, which lasted from five to six minutes, resembling the sound of cannon and musketry, and were followed by a long-continued noise, like that of many drums. The meteor from which the noise proceeded appeared not so much like a ball of fire as a small rectangular cloud, which, during the phenomenon, seemed not to move; but the vapour of which it consisted was sent out, after each explosion, in all directions. It seemed to be about half a league north-west from L'Aigle, and must have been at a very considerable elevation, as it appeared to the inhabitants of two villages, more than a league distant from each other, to be immediately over their heads at the same instant. Throughout the whole district over which the cloud hung there was heard a hissing noise, like that of a stone from a sling, and a vast number of stones fell to the ground. The space on which they fell formed an ellipse of $2\frac{1}{2}$ leagues long by 1 broad, the largest diameter being from south-east to north-west, the direction in which the meteor moved: the largest stones were found at the south-east end of the ellipse, and the smallest at the opposite extremity. Above 2000 were collected, and they varied in weight from 2 drams to 17½ lbs.

Aerolites, when taken up soon after their fall, are sometimes hot. They are generally angular, of prismatic and pyramidal forms, the angles being rounded; their broken irregular surface is coated with a fused black crust like varnish, seldom exceeding 1-50th of an inch, or a quarter of a line, in thickness. When broken, they differ a little in appearance; but they are, for the most part, composed of a collection of small spherical bodies, of a gray colour, imbedded in a gritty substance, and often interspersed with yellow spots. One of the most remarkable circumstances is the great similarity of composition of all the meteoric stones, on whatever part of the earth they have fallen. Iron, nickel, silica, magnesia, and sulphur are the chief ingredients, especially iron; but the earths alumina and lime, the metals manganese, chrome, and cobalt, together with carbon, soda, and water, have also been found in minute and variable quantities. Nothing with which we were not already acquainted has ever been discovered in their composition.

Chladni compiled a very copious catalogue of all recorded instances, from the earliest times; of which twenty-seven are previous to the Christian era, thirty-five from the

beginning of the first to the end of the fourteenth century; and eighty-nine from the beginning of the fifteenth to the beginning of the present century. Within the present century a vast number have been recorded; but the actual number must greatly exceed the recorded instances. Livy, Plutarch, and Pliny all speak of meteoric stones which had fallen in ancient times, when they were regarded as special visitants from the gods, and were consequently worshipped with great veneration. The best known example is that of the holy Kaaba at Mecca.

Besides aerolites properly so called, masses of malleable iron, often of vast size, have been found in situations which, together with their composition, leave no doubt as to their being of meteoric origin. An immense mass, seen by Pallas in Siberia, was found quite insulated, at a great elevation, on a mountain of slate near the river Yeneséi, removed from everything that could excite suspicion of its being a production of art, and totally different from any ore of iron seen either before or since that time. The mass, which weighed about 1100 lbs., was of an irregular form, not solid, but cellular like a sponge, the cells containing small granular bodies of a glassy nature, afterwards found to be the simple mineral olivine, so common in basalt. Another vast mass of meteoric iron was found in South America in 1778, about 500 miles north-west from Buenos Ayres. It lay in a vast plain of above 100 leagues in extent, half sunk in the ground, and its size was such as, estimating it by the specific gravity of iron, would give a weight of more than 13 tons. According to the analyses of Pronst and Howard, it contains 90 per cent. of iron and 10 of nickel. Another mass was found in Brazil, about 50 leagues from Bahia, the weight of which was estimated at 1400 lbs. Many other instances of similar masses of iron might be mentioned, which are evidently of meteoric origin; but the instances on record of iron having been actually seen to fall from the atmosphere are very rare. One fell at Rowton, near Wellington, in Shropshire, in 1876, which is in the British Museum, and which is only the second seen to have fallen in Great Britain.

The meteoric stones in the British Museum are divided into aerolites, aerosiderites, and siderolites. There are upwards of 200 specimens of aerolites, the largest of which weighs upwards of 130 lbs. There are over 100 specimens of aerosiderites or siderites—masses of native iron, usually nickeliferous, and containing phosphides of nickel and iron, troilite, and sometimes carbon—one of which is upwards of 3½ tons in weight. There are twelve siderolites, which consist of porous or sponge-like masses of nickeliferous iron, containing in cavities various silicates, such as are found in aerolites. The heaviest siderolite only weighs 16 lbs.

Aerolites and meteoric iron are not the only products of meteors which have fallen upon the earth after explosion. Numerous instances are mentioned of black and red dust, which has covered great tracts of land; and of the fall of a soft gelatinous matter of a red colour like coagulated blood, which may have given rise to stories of the sky having rained blood. Such appearances have not unfrequently accompanied the fall of stones.

Dust has been collected from the towers of cathedrals and other elevated positions, and on being placed under chemical and microscopical analysis, and tested with a magnet, was found to contain minute spherical corpuscles. In snow taken in various parts of France, and also by Nordenskjöld in the Arctic regions, the presence of iron was detected, and there were also irregular particles which were influenced by the magnet.

The nature of star showers, and of shooting stars in general, has now for some time been pretty well understood. We have been gradually forced to give up the

notion of empty interplanetary spaces. Whatever may be the case with the vast regions which lie beyond the solar system, it is now certain that, besides the larger visible planets, the whole space in which they move is crowded with smaller dark bodies careering round the sun—"pocket-planets," as Humboldt called them. Their presence is made known to us when, by the earth entering the orbit of their circulation round the sun, they are attracted hither and become visible in our atmosphere, some even falling to the earth.

When such a body enters our atmosphere, its own motion, combined with the motion of the earth, gives it an immense relative velocity—on an average about 30 miles a second. The friction thus occasioned by dashing against the particles of the air soon raises the outside to a white heat, hence the shooting-star illumination. The molten or vaporized surface flows off, leaving a blazing train behind, and after a longer or shorter career the body is exhausted—burnt out and extinguished. The larger masses, or "fire-balls," sometimes explode, and fall to the earth as aerolites; but by far the greater number never reach the earth, except in the shape of the impalpable powder to which combustion reduces them.

Shooting stars, accompanied by a train of light, and seen on any clear night, are generally visible for little more than a second. Their height ranges from 30 to 70 miles above the earth's surface. The attention of scientific men was first drawn to the celebrated November shower of meteors by that of 1833, when it was found that similar ones had been recorded in 1799, and also in 1766, but not so clearly. The German astronomer Olbers was thus led to conjecture that their appearance might be periodic, recurring in periods of thirty-three years, and that, consequently, another such shower might be expected in 1866. This conjecture, as is well known, was faithfully and brilliantly verified; and in 1864 Professor Newton, of Yale College, United States, collected and discussed all the accounts respecting the November star-shower to be found in historic records, European, Arabian, and Chinese; and from them he also calculated that there would be another larger shower on the night of 13th November, 1866. He further discovered the important fact that the node of the orbit of the meteors had a direct motion upon the plane of the ecliptic—an effect clearly due to the disturbing actions of the planets on the meteors. Adopting this view, Professor Adams ascertained that the true orbit of the meteors is a very eccentric ellipse, the time of revolution of the meteoric stream round the sun being thirty-three years and a quarter. It has been conjectured, upon good grounds, that the meteoric stream was originally a mass of nebulous matter, drawn into the solar system by the distinct action of some of the larger planets, in the same manner as Lexell's comet had been thrown into a new orbit and rendered visible by the disturbing action of Jupiter. Le Verrier assumed to have found that the November meteors were originally introduced into the solar system in A.D. 126, in consequence of having approached very near Uranus. The periodicity of the August meteors, from the 9th to the 14th, was first ascertained by Quetelet, who also pointed out the remarkable relations between the elements of the orbit of the November meteors and those of the first comet of 1866. The August meteors are found to follow the track of the great comet of 1862. The same relation would seem to exist between the orbits of other noted meteor systems and other known comets; and thus the thought is suggested that every comet has its train of meteoric bodies following in its wake, and that perhaps every meteoric cloud has, or may have had, its comet.

We say "may have had," because of the remarkable circumstance connected with Biela's, or the "lost comet." [See COMETS.] This comet was well known for its

periodical visit every six and three quarter years, and latterly as having, in 1846, separated into two distinct comets. Since 1862, however, nothing has been seen of Biela's comet, though it ought to have paid us several visits, one of them being due at the end of 1872. The newly-discovered connection of comets and meteors naturally caused astronomers to exercise a careful watch when the earth, in 1872, passed nearest to the orbit of the missing comet, in the expectation of probably witnessing a shower of meteors. Such a meteoric display really did occur, and a brilliant one too; and Professor Herschel considered that it formed another instance of the many proofs, already derived from observations of meteor showers, of the identity of their origin with that of comets. What may be the nature of the mysterious connection is, however, uncertain.

AERONAUTICS. See BALLOON.

ÆSCHINES, commonly called the "Orator," to distinguish him from another of the same name, was born at Athens about B.C. 389.

He declared himself to be of distinguished birth, but his rival Demosthenes declares that he was the son of a courtesan. In early life he was unsuccessful as a comedian; afterwards he served in the Athenian army with some distinction, and when he came forward as a public man he became a formidable rival to Demosthenes.

Only three orations of Æschines are extant, all of which relate to important events in his public life. He was accused by Demosthenes, one of his fellow-ambassadors, of corruption in the second embassy to Philip of Macedon (B.C. 346), the object of which was to obtain Philip's ratification of the treaty of peace; and to this attack he replied in his oration entitled "On Malversation in his Embassy." Timarchus, a friend of Demosthenes, had joined in the attack on Æschines; but the orator rid himself of this adversary by successfully prosecuting him for a disreputable course of life. The oration on this subject is called "Against Timarchus." The delay caused by the prosecution of Timarchus deferred the prosecution of Æschines till about three years after his return from the second embassy. On this occasion Æschines was acquitted. The third oration is entitled "Against Ctesiphon," but is, in fact, an attack on Demosthenes, who replied in his famous oration "On the Crown." Ctesiphon had proposed that a golden crown should be voted to Demosthenes for his services against Philip of Macedon. The cause was not tried till B.C. 330, after the death of Philip, while his son Alexander was in the midst of his Asiatic conquests. Æschines lost his cause, and not having obtained one-fifth part of the votes of the jury, he was compelled to leave Athens, being unable to pay the penalty in that case required by the law. He retreated to the island of Rhodes, where, it is said, he opened classes for instruction, and became the founder of a school of rhetoric. When the Rhodians listened to a repetition of his oration "against Ctesiphon" they asked with astonishment how, after such eloquence, the orator should have been defeated. "You would cease to wonder," said Æschines, "had you heard Demosthenes!" Æschines is said to have died at Samos, B.C. 314.

The Greek and Roman critics considered the Rhodian school of eloquence, of which Æschines was the reputed founder, to be characterized by a happy mean between the florid Asiatic and the dry and more sententious Athenian style. The style of Æschines is distinguished by great perspicuity and correctness. His narrative powers deserve high praise, nor can we undervalue his powers of abuse, though here he falls below his great rival.

The best edition of the text of Æschines is in Bekker's edition of the "Attic Orators," Oxford, 1822, five vols. 8vo. One of the best editions of Æschines alone is by J. H. Bremi, 1823-24, two vols. 8vo. The Abbé Anger translated

the orations and letters of Æschines into French. The oration of Æschines against Ctesiphon, with the reply of Demosthenes, was translated into Latin by Cicero. There is an English version by Andrew Portal, and another by Thomas Leland, London, 1770, 8vo.

ÆSCHYLUS, the father of the GREEK DRAMA, was the son of Euphorion, and a native of Eleumis in Attica. He was born about 525 B.C. Few particulars of his life are recorded, but it is known that he fought in the battles of Marathon, Salamis, and Platea, and witnessed the defeat of Darius and of Xerxes. In the later years of his life he left Athens for Sicily, where he was honourably received by Hiero, king of Syracuse, a liberal patron of men of letters, who had collected around him some of the most illustrious writers of that day. Here he remained (with occasional visits to Greece) till he died in the year 456 B.C., at the city of Gela, being then in the sixty-ninth year of his age. The myths which gather round the birth and death of the world's great men are not wanting to Æschylus; thus it is said the oracle which decreed that his death should be caused directly from heaven (heaven and the sky are synonymous in Greek), was literally fulfilled by an eagle which had seized a tortoise, and which was seeking a large stone whereon to drop it to break its shell, mistaking the poet's bald head for what it sought, and thus bringing him a swift death.

He competed for the prize in tragedy as early as B.C. 499, when he was only twenty-five—but he was not successful until 484. He was undisputedly at the head of dramatic art until 468, when SOPHOCLES defeated him in a contest, and it may have been his disappointment at this which threw him into the arms of Hiera.

He was called the Father of Tragedy from the important alterations he made in the art, whereby at one bound it leaped to that perfection which makes it still admirable and in its own way unequalled. That must, indeed, have been a poor art which could not advance beyond the detached monologue of one actor at a time, yet we know that Æschylus was the inventor of dialogue. Sophocles introduced a third actor, an extension which, in his later plays, Æschylus himself approved and adopted. At the same time the old dithyrambs or choral odes were reduced by Æschylus to the elegant form of the *chorus* [see GREEK DRAMA], a dramatic resource often sadly wanted in our modern art to the avoidance of clumsy soliloquies; further, he enlisted the services of his friend, the painter AGATH-ANGUS, and created the art of scene-painting; finally, he brought up to the rank of a fine art the great branch of costume, and by raising his actors on thick-soled boots and fitting them with large masks, he adapted himself to the conditions of the huge structure of the ancient THEATRE. He was his own musician and his own ballet-master, the choral melodies and dances being made important accessories by him. Finally, to him is due the invention of the trilogy, or triple drama—each being complete in itself, but all three telling a complete story. (It is curious to notice how often the latest development of the opera, under Wagner, follows the same lines.) Æschylus was the author of seventy plays, and gained the prize for dramatic excellence thirteen times, but of his works only seven tragedies remain, entitled respectively, "Prometheus Bound," "Seven against Thebes," "Persians," "Suppliant Women," and the famous Orestiad trilogy, consisting of the "Agamemnon," the "Chæphori" (libation-bearers), and the "Eumenides" (Furies). The plots of the plays of Æschylus are very simple, and the events follow each other without complexity; but the style of the poet is energetic and sublime, his moral purpose elevated, and his dramatic power of the highest order. His dramatis personæ are more often gods, Titans, and heroes, than men and women.

The text of his works has been greatly corrupted by the

copyists, and many passages are of Wellauer, and of Dindorf in Germany, and of Scholefield (Cambridge) are the best. Of English translations there is the old poetical version of Robert Potter, the translation into literal prose by Buckley, and the modern poetical versions of Blackie, Plumptre, and Swanwick.

ÆSCHYNO'MENE is a genus of the order LEGUMINOSÆ, or Pea family. In India the soft pithy stem of *Æschynomene aspera* is cut into thin slices, pasted together, and under the name of *solah* is used to make hats and other articles for which lightness and elasticity are necessary.

ÆSCULA'PIUS, or more properly, according to the Greek form of his name, ASCLEPIUS, was the god of medicine in ancient mythology; but several personages of the name are mentioned. The Egyptians also had their Æsculapius (as the Greeks call him), the son of Hermes. But the Greek Æsculapius, the reputed son of Apollo, was the most celebrated, and it is to him that the tales current among the poets and mythologists refer.

According to Pindar, Apollo sent his child to be educated by the centaur Chiron, who instructed him in medicine. Having reached manhood, he went with Castor and Pollux on the Argonautic expedition. Returning to Greece he astonished all men by his skill, for he not merely cured all diseases, he even recalled the dead to life. Thus, at the request of Artemis he restored HIPPOLYTUS to life, and other myths of the same kind are attributed to him; eventually Zeus (Jupiter) struck him dead with lightning, on the complaint of Pluto that Hades was thus defrauded of its people. Asclepius was raised to heaven at the request of Apollo, and made a constellation under the name of Ophiuchus, the serpent-holder. He will be found in the large Plate of the CONSTELLATIONS close to the figure xvii. in both hemispheres, touching Hercules and Scorpio respectively.

In Greece, the original seat of Asclepius' worship was in the neighbourhood of his birthplace, at Epidaurus, where a splendid temple was erected to his honour, adorned with a chryselephantine (gold and ivory) statue, half the size of the statue of Olympian Zeus at Athens. He was represented sitting, one hand holding a staff, the other resting on a serpent's head; a dog couched at his feet. In coins and other ancient remains he is commonly seen with a long beard, holding a staff with a serpent twined about it. He is accompanied by an owl or a cock; and it will be remembered that the last words of Socrates were, "Crito, we owe a cock to Asclepius." At Epidaurus there was a peculiar breed of yellowish-brown snakes, of large size, harmless, and easily tamed, which frequented the temple, and in the form of which the god was supposed to manifest himself. At Epidaurus Pausanias saw in the second century six stones in the sacred precinct, erected in commemoration of cures performed by the god, recording, in the Doric dialect, the names and diseases of the patients, and the method of cure.

The sons of Asclepius, Machaon and Podalirius, are mentioned in Homer as the physicians of the Greek army.

For some centuries after the Trojan war medical skill seems to have been confined to the temples of Asclepius, which were numerous in all parts of Greece. That at Athens was at the foot of the Acropolis (see Map). In these his supposed descendants, the Asclepiadae, who formed the priesthood, were alone allowed to practise. In later times pupils were admitted into the brotherhood, having been solemnly initiated, and sworn to conform to its rules. The god often gave his own prescriptions in dreams and visions, and the patients were to be prepared by religious rites for this divine intercourse. Bathing, abstinence, and tranquillity, the healthy positions always chosen for the temples, and the confident hope of benefit, may often have

produced very beneficial effects; and, in a long course of experience, it is more than probable that some really valuable knowledge of symptoms and remedies had been collected.

ÆSCULUS. See HORSE-CHESTNUT.

ÆSOP (Æsopus) was probably born about B.C. 619, and was a contemporary of Solon and Pisistratus. He has long passed as the inventor of those short moral fictions which we call fables. The popular stories of him are derived from a Life, written and prefixed to a collection of fables, bearing the name of Æsop, by Maximus Planudes, a monk of Constantinople, about the middle of the fourteenth century; but this Life is proved totally unworthy of credit, and the fables now bearing his name are shown to be spurious by Bentley in his "Dissertation on Æsop," subjoined to that on Phalaris.

There is little information in the ancient writers relating to Æsop, and even the place of his birth is uncertain. He is said to have been a slave to three successive masters, the last of whom, Ladmon, freed him. The reputation which he got by his fables is said to have procured him an invitation from King Croesus to come to Sardis, where he saw Solon. Æsop is said to have visited Athens during the usurpation of Pisistratus, and to have there composed the fable of Zeus and the Frogs (Phædrus, i. 2). He was charged by Croesus with an embassy to Delphi, and also with the distribution of a sum of money to every Delphian; but he returned the money to his patron, alleging that those for whom it was meant were unworthy of it. The disappointed party got up a charge of sacrilege, upon which they put him to death. A pestilence which ensued was attributed to this crime, and the Delphians made proclamation of their willingness to make compensation for Æsop's death, to any person who should claim it. A grandson of his last master, Ladmon, at length claimed and received it. This singular tale rests on the authority of Herodotus, and as it must have taken place within the memory of many with whom he might have conversed, it may be true. (Herod. ii. 134.)

The time of Æsop's death is uncertain. But if what has been stated is true, he died before the capture of Sardis by Cyrus, or between the years 550 and 544 B.C. The Athenians erected a statue in his honour, which was made by Lysippus.

Fables passing under the name of Æsop were popular in Athens during the most brilliant period of its literary history. The "drolleries of Æsop" are mentioned by Aristophanes in terms which imply that they were repeated at convivial parties. Socrates, in prison, turned into verse "those that he knew;" and Plato, who banishes the fictions of Homer from his ideal republic, speaks with high praise of the tendency of those of Æsop. Demetrius Phalereus made a collection of Æsopian fables, and there were two metrical versions of them of still later date, one by an anonymous author, the other by Babrius. The latter was a Greek of the time of Augustus, and no less than 123 of his metrical fables after Æsop were discovered about the middle of the present century in the monastery of Mount Athos. Phædrus published a collection of fables in Latin verse in the time of Tiberius, the materials of which he professes to have taken from Æsop. There is another collection, written in elegiac verse, in the fourth century, by Avianus.

The editions of the fables of Æsop are very numerous. The edition of J. G. Schneider, Breslau, 1812, contains 231 fables attributed to Æsop. The translations and imitations in modern languages have appeared at intervals, from the invention of printing to the present time.

The eastern philosopher and fabulist Lokman has been supposed to be the same person as Æsop. See LOKMAN.

ÆSTHETICS. *Æsthetik* is the designation given by German writers to a branch of philosophical inquiry, the object of which is a philosophical theory of the

beautiful, or, more definitely expressed, a philosophy of poetry and the fine arts, and which has by them been raised to the rank of a separate science. The word *æsthetik* is derived from the Greek *αἰσθητικός* (that which concerns feeling or perception), and was first used as a scientific term by Baumgarten, who, in his "*Æsthetica*" (Frankfort, 1750-58), considered beauty as a given property of objects, of which we are becoming sensible. The problem of the nature of beauty, and the kindred subjects, the sublime and the ludicrous, have occupied the attention of philosophers from the time of Socrates. According to Xenophon, Socrates considered the beautiful and the good as the same, and resolvable into the useful. Whatever was exactly suited to its purpose of furthering the necessary ends of life, was, only so far and only on that account, both good and beautiful. Plato connected beauty with his theory of ideas, maintaining that there was an absolute beauty, self-existent and independent of beautiful things. He considered the heavenly bodies the most beautiful of visible objects, because they came nearest to the ideal figures of self-existent forms, such as quickness and figure, which in themselves are not visible, but only conceivable. With Aristotle, beauty involved orderly arrangement and a magnitude neither too large nor too small. To come to modern times, Kant denied the possibility of a strict science of beauty, inasmuch as beauty, according to him, is not a property of objects, but has its origin in the disposition of our mental faculties. Beauty, according to Schelling, is that manifestation of the principle of art where the infinite appears contained in, or represented by, the finite, or where, in the very object, the difference between the conscious and the unconscious (mind and nature) is annulled. Sir Joshua Reynolds says that beauty is what is above "all singular forms, local customs, particularities, and details of every kind." Hogarth mentions six elements of beauty—fitness, variety, symmetry, simplicity, intricacy, and magnitude. Burke says that beauty is that tendency in objects to produce an agreeable relaxation of the fibres. Alison maintains that beauty is the production of some simple emotion and a peculiar exercise of the imagination. Jeffrey adopts Alison's theory, stating it thus:—"Our sense of beauty depends entirely on our previous experience of simpler pleasures or emotions, and consists in the suggestion of agreeable or interesting sensations with which we had formerly been made familiar by the direct and intelligible agency of our common sensibilities; and that vast variety of objects, to which we give the common name of beautiful, become entitled to that appellation, merely because they all possess the power of recalling or reflecting those sensations of which they have been the accompaniments, or with which they have been associated in our imagination by any other more casual bond of connection." Ruskin, in the second volume of "*Modern Painters*," connects the elements of *typical beauty* with the attributes of the Deity: infinity is the type of the Divine incomprehensibility; unity, the type of the Divine comprehensiveness; repose, the type of Divine permanence; symmetry, the type of Divine justice; purity, the type of Divine energy; moderation, the type of Divine government by law. *Vital beauty* is superadded to typical beauty, and consists in the "appearance of felicitous fulfilment of function in living things," that is, of adaptation to ends. Bain considers three characteristics as distinguishing the productions of fine art which seek to gratify the æsthetic emotions. Pleasure is the *immediate end* of fine art, whereas we eat to live. It must be a *refined* pleasure; everything disagreeable should be excluded. And thirdly, it must be *unrestricted*—free to be enjoyed by a great number. Beauty is due to a plurality of causes. The simple sensations of the ear and the eye are in themselves

pleasurable, as, for example, waxing and waning sounds. The pleasures of the other senses are refined by being presented only in idea, thus the feeling of warmth or of coolness is artistic when suggested in a picture. The emotions are a source of æsthetic pleasure when they comply with the conditions already enumerated. Other elements of beauty are harmony, fitness of means to ends, unity in diversity, and a suggestion of something to be desired or to be filled up by the imagination. The *sublime* is defined by Bain as "the sympathetic sentiment of superior power in its highest degrees;" the other species of æsthetic emotion, the *ludicrous*, is occasioned by "the degradation of some person or interest possessing dignity, in circumstances that excite no other strong emotion."

ESTIVATION is the term used in botany with reference to the mode in which the different parts of the calyx and corolla are arranged in the bud. This arrangement of parts may be considered either separately or in their relation to one another. If the edges overlap, the æstivation of the calyx or corolla (as the case may be) is said to be *imbricate*; if they meet without overlapping, the æstivation is *valvate*. In the former case, when the edges run spirally, the æstivation is *contorted*. Considering the different parts separately, various terms are employed—*corrugate*, when crumpled, as in the corolla of the poppy; *induplicate*, if the edges are rolled in; *reduplicate*, if turned out. The æstivation may differ in the calyx and corolla of the same flower; for instance, the calyx may be valvate and the corolla imbricate.

ÆTHELBALD. See **ÆTHELBALD**.

ÆTHELBERT. See **ÆTHELBERT**.

ÆTHUSA is a genus belonging to the order *UMBELLIFERÆ*, which includes among its species one of the most poisonous plants known in Europe. As many fatal accidents have occurred from the incautious use of its leaves, we shall give a minute description of it.

Æthusa Cynapium is a little annual plant, found commonly in gardens and fields, resembling the common parsley so much that it has acquired the vulgar name of "fool's parsley." From a taper whitish root arises an erect branchy stem, about a foot high, generally stained with purple near the ground. This is covered by finely cut shining leaves of a deep green, much resembling those of garden parsley, from which they are known thus: in the true parsley the leaves are twice pinnated or divided, and the leaflets are broad, and cut into three wedge-shaped toothed lobes; in the fool's parsley, on the other hand, the leaves are thrice pinnated, and the leaflets are narrow, sharper, and jagged; besides which, the leaves of fool's parsley have a disagreeable nauseous smell, instead of the fine aromatic odour of common parsley. When in flower *Æthusa* has its principal umbels destitute of involucre, while the partial umbels are furnished with an involucre, consisting of four or five narrow sharp leaves, hanging down from one side only of the common stalk; this last circumstance distinguishes it when in flower, not only from parsley, but from all other British umbelliferous plants.

Many dangerous accidents have occurred from mistaking this plant for parsley. In one case, a person who had eaten it with salad died in little less than an hour; and in another, the patient, although the stomach was emptied at a very early period, sank gradually, and died at the end of a few days. The symptoms attendant upon poisoning by *Æthusa* are, swimming of the head, nausea, cold perspiration, and chilliness at the extremities. To counteract its effects emetics are recommended.

ÆTION (*Ἀΐτιον*), a celebrated Greek painter, and, according to Lucian, one of the best ancient colourists. That writer mentions *Ætion*, *Apelles*, *Euphranor*, and *Polygnotus* as the most successful of the ancient Greek painters in the mixing and laying on of colours; and

speaks of the first as the most distinguished painter of his time, describing a very celebrated picture by him of the marriage of Alexander and Roxana, exhibited at the Olympic games, which pleased *Proxenus*, one of the judges, so much that he gave *Ætion* his daughter in marriage.

ÆTIUS, a Roman general, distinguished as the preserver of Gaul against *ATILIA*, the "scourge of God," whom he defeated with the help of Theodoric, king of the West Goths, at Chalons, in A.D. 451. His base master, *Valentinian III.*, incapable of appreciating his noble character, grew fearful of the great popularity of *Ætius* with the army and caused him to be murdered, 454.

ÆTIUS (*Ἄϊτιος*) of Amida in Mesopotamia, a Greek writer on medicine, who probably lived about the end of the fifth and the beginning of the sixth century of our era, as we may infer from the persons whom he mentions. His work contains some curious examples of the pretension to cure diseases by means of superstitious ceremonies. (Fabricius, "Biblioth. Græc." ix. p. 228; Latin trans. by *Carnarius*, Basel, 1512, &c.)

ÆTOLIA, a country of ancient Greece, consisted of two chief divisions, one on the coast, extending from the mouth of the *Achelous* eastwards, along the north shore of the Corinthian Gulf as far as its narrow entrance at *Antirrhium*; the other, called *Epiktetos*, or *The Acquired*, was the northern and mountainous part. The length of sea coast, according to the best modern charts, is about 12 miles, measuring in straight lines from one projecting point to another. It forms, with *Acarnania*, a department of modern Greece.

The chief towns are *Missolonghi*, the capital, where *Lord Byron* died in 1821; and *Lepanto*, where the Turkish fleet was defeated by the Allies, under *Don John of Austria*, in 1571.

AFFIDAVIT is a statement of facts in writing made before a magistrate or other person authorized to administer an oath, and confirmed by an oath sworn, or by a solemn affirmation. Affidavits are necessary in many cases in order to bring facts under the cognizance of courts of justice. All evidence of facts must be given on oath or affirmation, either orally or by affidavit. It is required by English courts that the declaration shall be made in the first person; it must contain the name and designation of the person making it, and must be signed by him at the foot. When evidence is to be received by juries it is generally given orally, but when it is to be laid before a court or a judge it is usually reduced to the form of an affidavit. Affidavits are also frequently used in bankruptcy proceedings, and in the administration of the revenue. In Scotland voluntary affidavits are not generally received as evidence, but there are exceptions to this rule—notably that under the Scotch Bankruptcy Act, where it is required that claims must be lodged with affidavits of verity. The lord chancellor of England is empowered to grant commissions for taking affidavits, affirmations, and declarations in Scotland; and affidavits may be made abroad before any British ambassador, envoy, secretary of embassy, or consul.

AFFINITY (from the Latin *affinitas*) means a relationship by marriage. The husband and wife being legally considered as one person, those who are related to the one by blood are related to the other in the same degree by affinity. This relationship being the result of a lawful marriage, the persons between whom it exists are said to be related *in law*; the father or brother of a man's wife being called his *father-in-law* or *brother-in-law*. Affinity may be an impediment to marriage, for persons related by affinity are forbidden to marry within the same degrees as persons related by blood. This rule, which excludes from marriage those who are within certain degrees of affinity, is supposed to be founded on the Mosaic law; but the eighteenth chapter of *Leviticus*, on which the prohibition is

founded in the case of a deceased wife's sister, is interpreted by some persons as not relating to marriage; and if the authorized translation be preferred the prohibition is clearly limited—"Neither shalt thou take a wife to her sister, &c., . . . in her life time." The degrees of relationship, both of consanguinity and affinity, within which marriages are prohibited, are contained in Archbishop Parker's "Table of Kindred and Affinity, wherein whosoever are related are forbidden in Scripture and our laws to marry together." Parker, of his own authority, ordered the Table to be printed and set up in the churches of his province of Canterbury. The Constitutions and Canons Ecclesiastical, which were made in the reign of James I. in 1603, confirmed Parker's Table, which thus became part of the marriage law so far as that law was administered by the ecclesiastical courts.

The prohibition against a man marrying his deceased wife's sister is considered by many to rest on no good reasons, scriptural or other, and repeated attempts have been made to remove it; but the measure has hitherto been defeated in the House of Lords, though of late years always successful in the House of Commons.

The distinction between affinity and consanguinity is derived from the Roman law. The kinsfolk (*cognati*) of the husband and wife became respectively the *affines* of the wife and husband. We have borrowed the words affinity and consanguinity from the Roman law, but we have no term corresponding to *affines*. The Romans did not reckon degrees of *affinitas* as they did of consanguinity (*cognation*); but they had terms to express the various kinds of *affinitas*, as *socer*, father-in-law; *socrus*, mother-in-law, &c.

AFFINITY, CHEMICAL, is the name given to that power by which bodies combine together to form compounds. It was formerly termed chemical attraction, on the hypothesis that it draws the atoms closer to each other; thus two volumes of hydrogen and one volume of oxygen unite to form two volumes of steam. In many cases, however, the compounds formed occupy the same or even a greater space than that filled by their constituents; hence the term attraction is now generally discarded. Of the real nature of this force nothing is known; the whole range of chemical phenomena tend to show that it is intimately connected with that general "energy" which under various circumstances manifests itself as heat, light, magnetism, electricity, and mechanical force, since the action of chemical affinity is heightened, modified, or suspended by the operation of any of these forces. Thus, carbonic acid and lime unite at common temperatures, whilst at a red heat their affinity is destroyed and they separate; but if while apart the gas and lime be subjected to pressure, even at a red heat, affinity comes again into play, they reunite, and carbonate of lime is reformed.

The electric spark passed through gaseous mixtures causes the combination of many of these. Hydrogen and oxygen unite to form water. Nitrogen and oxygen form nitrous and nitric anhydrides, acetylene is formed in the voltaic arc. On the other hand, the voltaic current breaks up nearly all compounds into their constituents. Light, in like manner, under certain conditions, assists chemical affinity, whilst under others it retards or altogether annuls it. Chlorine and hydrogen gases, if mixed in the dark, may be kept as a mixture for an indefinite time; exposed to light they immediately unite with explosive force. In the process of vegetable growth the sun's rays break up combinations of oxygen with carbon and hydrogen and metals of the earth; but the action of chemical affinity is only changed in direction, since from new combinations of these elements, under the influence of vitality, are formed the numberless substances of which both the vegetable and animal organisms consist.

Chemical affinity acts only at sensible distances, and the strength of the attraction is determined by the peculiar nature of the substances concerned. In this last property it resembles the attraction of cohesion, but is distinguished from it by occurring only between the particles of dissimilar bodies. Thus the particles of a mass of sulphur are held together by cohesion, and so also are those of a mass of copper; but if an atom of sulphur be brought into contact with an atom of copper, the two particles, being different and possessing chemical affinity for each other, unite by this power, and form sulphide of copper.

In all mere mixtures two liquids may exist together in almost any proportions; and solids may be dissolved in liquids in all proportions up to the point of saturation. The properties of mixed liquids are intermediate between those of their components, and in solutions the dissolved body imparts its qualities in proportion to the amount dissolved; but when chemical affinity operates the physical properties of the resulting compound differ altogether from those of its components, and in the chemical compounds brought about by affinity the proportions are always definite. Some liquids, such as mercury, water, and oil, have no tendency to unite in any proportion whatever, unless by indirect means.

The simplest cases of chemical affinity are those in which two bodies unite into a binary compound. Such are the metallic chlorides, oxides, and sulphides, hydrochloric acid, sulphuretted hydrogen, and the like. But chemical affinity may be exerted between two compound bodies, producing substances which are termed binary compounds of the second order. Such are the oxygen salts, sulphur salts, hydrated chlorides, &c. These compounds in turn exercise chemical affinity towards each other, and form binary compounds of the third order, such as the double salts.

The relative affinity of one body for two others is dependent on surrounding conditions; thus iron at a red heat decomposes steam, setting hydrogen free; but if hydrogen be passed over red-hot oxide of iron, the iron is reduced to the metallic state, and water is formed. Potassium decomposes carbonic acid at a red heat, but, on the other hand, carbon decomposes potash if strongly heated with it, and sets potassium free.

The effects of chemical combination, induced by chemical affinity, are very remarkable. For instance, sulphur is yellow and copper is red, but a compound of the two is black; acids give a red tint to vegetable blues, and alkalis give them a green tint; but a salt compounded of an acid and an alkali seldom affects the colour. There are numberless other cases in which the form, colour, smell, taste, density, and other physical qualities, and the chemical properties of fusibility, volatility, solubility, and tendency to combination, in the compound, bear no resemblance to those possessed by its constituent parts.

Chemical affinity, in most cases, acts much more powerfully when the bodies are in the liquid than the solid state; while others, again, require the gaseous state for its full development. Solid bodies can only be made to combine by continued rubbing together or by conversion into a plastic state by heat.

Proportion, heat, electricity, and light, all influence the strength and nature of affinitive combination. If sulphuric acid and alcohol combine in equal proportions they produce sulphuric ether, but if the proportion of acid be ten times as much as that of alcohol, olefiant gas is produced. With respect to *heat*, the difference is not less striking. When mercury is moderately heated in atmospheric air it is converted into mercuric oxide, by combining with the oxygen of the air; heat the compound thus formed more strongly than was required for its production, and the affinity is destroyed—oxygen gas is given off, and the mercury returns to the metallic state. And so on of other bodies.

AFFIRMATION is the solemn asseveration made by Quakers, Moravians, and Separatists, in cases where an oath is required from others. This indulgence was introduced by the 7 & 8 Wm. III. c. 84, which enacts that the solemn affirmation of Quakers in courts of justice shall have the same effect as an oath taken in the usual form. The provisions of this statute are explained and extended by 8 Geo. I. c. 6, and 22 Geo. II. c. 46, s. 36; but Quakers were still prevented from giving evidence on affirmation in criminal cases. This exception was removed by 9 Geo. IV. c. 82. The 18 & 19 Vict. c. 2, extended the privilege to all persons who, in the opinion of the judge, refuse to be sworn from conscientious motives. By the 32 & 33 Vict. c. 68, amended in the following year by the Evidence Amendment Act, 1870, an affirmation is allowed to be taken in cases where the presiding judge is satisfied that an oath will have no binding effect upon the conscience. It has been decided, however, that this alternative does not extend to the taking of a seat in Parliament; only those first named, viz. Quakers, Moravians, and Separatists, being allowed to affirm. In all cases of legal affirmation the same severe penalties attach to false evidence, &c., as upon the taking of oaths.

AFFIX, a term in grammar, to which the name of *suffix* also is sometimes given. It signifies a syllable attached to the end of a word, by which the form and signification of the word are altered. This will be best explained by some examples from our own language. In the words *wealth-y*, *weight-y*, *bulk-y*, and in *god-ly*, *odul-ly*, &c., the syllables *y* and *ly* are the affixes, which qualify the meanings of the words to which they are attached, and fit them for a new and different use; as "this man loves *wealth*;" "that is a *wealthy* merchant." Verbs are in this way made from adjectives, as from the adjectives *sharp*, *quick*, *thick*, we have *sharpen*, *quicken*, *thicken*, respectively; and adjectives and adverbs from nouns, as in the examples just given. The *'s*, which marks our possessive case, is an affix, having originally been a distinct syllable, as we see from our old books in such expressions as *Goddes will*, *mannes duty*. Some persons are of opinion that this *'s* has arisen from the possessive pronoun *his*, as in such a phrase as *God his will*, *man his duty*; but we are of opinion that this final *'s* is to be referred to the German and Anglo-Saxon genitive termination *es*. When we hear people vulgarly say *hien*, *hern*, for *his*, *her*, the *n* is the remnant of the syllable *en*, which in these instances marks a kind of pronominal adjective, akin to the genitive or possessive case; as we may still observe in the German form *dessen*, &c. In the Latin and Greek, and many other languages, there is the same system of affixes, of which we have given examples in the words *weighty*, *bulky*; and in these languages the different cases of nouns and adjectives, and the different tenses and persons of the verbs, are also formed by affixes. Thus the nominatives *Pindarus-s*, *Homerus-s*, *Livius-s*, *Antonius-s*, are the true Roman forms of these names, which in the accusative form *Pinduru-m*, *Homeru-m*, &c. With the English it is the common practice to shorten all these words to Pindar, Homer, Livy, Antony; and yet we are not consistent in this practice, for we say *Tibullus*, *Æmilius*, &c.

AFGHANISTAN. The mountainous country reaching from Beloochistan northward to the Oxus river, and the low-lying Turkoman desert beyond the Hindu-Kush; and from the frontier of Persia on the west to the skirt of the Punjab, to Kafiristan, and the Pamir plateau on the east, takes its name from the Afghan tribes who form the greater part of its population. It extends about 500 miles each way, has an area of more than 225,000 square miles, and is thus somewhat larger than France.

Physical Features.—Afghanistan is an elevated table-land, the eastern base of which is washed by the Indus

river. A comparatively narrow tract of low ground divides the mountain-masses which constitute the eastern edge of the table-land. These masses generally rise with a steep acclivity to an elevation of about 6000 feet above the sea, and on their summit the table-land extends westward to the boundary-line of Persia. But in proceeding in that direction the elevation diminishes, so that along the greater part of the western boundary-line of the country the table-land is probably less than 3000 feet above the sea-level.

The plateau, however, is by no means a level and unbroken one. Four-fifths of its surface are covered with mountains and valleys, which have a general direction west and south-west from the huge central knot of the Pamir towards the more level deserts of the Persian plateau.

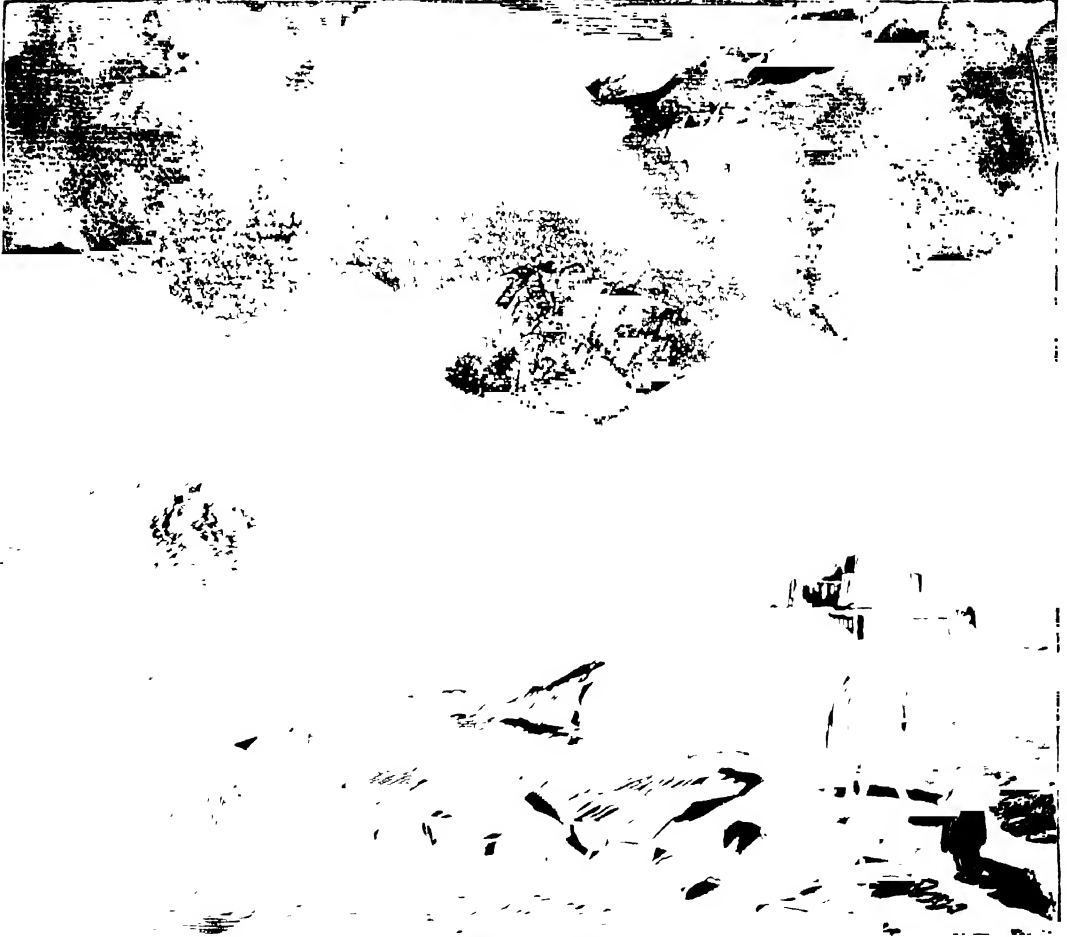
Along the northern border extends the vast Alpine range of the Hindu-Kush (over 20,000 feet in elevation), which bears this name for nearly 400 miles, from the Pamir to the Haji-Kak Pass (12,190 feet) between Cabul and Bamian. Beyond this pass the range is continued westward, and is called the Koh-i-Baba, a snow-clad range 18,000 feet in elevation, which is prolonged still westward by the Safid Koh, and by other mountains which form the northern edge of the plateau of Iran, ultimately joining the Elburz range south of the Caspian. The stupendous range of the Hindu-Kush has formed in all times the chief barrier between the plains of Hindustan and their invaders from the north-west. It is pierced by about twenty passes, which rise from 10,000 to nearly 20,000 feet in height; are impracticable for vehicles, and extremely difficult for any passengers at all. Snow impedes them during most of the year. The best known are those of Haji-Kak, Baroghil (Chitral), Dora, Unksan, Klawak, and Salanlang. These, as are the others, lead from the basin of the Oxus into that of the Cabul river, of which the Hindu-Kush forms the northern limit.

On the eastern side, next India, the margin of Afghanistan is formed by the Soliman Mountains, which, although not much elevated above Afghanistan itself, are 6000 or 7000 feet above the Indus in the immediate vicinity. The most elevated peak of the range is 12,000 feet above the sea. Between the Hindu-Kush and the Soliman ranges many high masses run out south-westward, inclosing between them numerous well-watered and fertile valleys, as well as high, cold, treeless, pastoral table-lands, which merge in the south-west into the bare deserts of Beloochistan and Eastern Persia.

The Soliman Mountains are interesting, not only from their geographical importance, but from the historical associations attaching to them, and from their having contained, in all ages, the gates to the vast empire of India. There are various passes, the five principal being the Khyber, Kurrun, Gomul, Sanghar, and Bolan; and through these, for many centuries past, the conqueror, the trader, and the pilgrim have in turn made their way. The Khyber Pass is generally regarded as leading to Cabul, but it is really only the first (and by no means the most difficult) of several passes to be traversed on this special route before reaching the Afghan capital. The actual Khyber gorge commences near Jumrood, about 10 miles westward of Peshawur, and is here a cleft about 150 yards wide in massive cliffs of slate. Up the bed of a treacherous little streamlet—which is apt at certain times to suddenly become an impetuous flood—through overshadowing crags about 1500 feet high, the pathway winds for 10 miles through a defile with an average width of 150 feet to a point where, in an imposing situation on a great wall of rock, there stands the fortress of Ali Musjid. Two miles beyond, the defile opens into a little valley, which marks the middle of the route. It is, however, considerably below the summit or crest of the pass, to reach which the traveller must

scale the narrow natural staircase of Sundee Khana—a mere ledge of rock along the treacherous edge of a cliff, with a rocky wall towering above, on the one hand, and a yawning abyss opening below, on the other. This ledge forms the most defensible point of the entire pass, being almost impracticable for artillery, and easily held by a small body against comparatively numerous assailants. The remainder of the way is less difficult, and at Dakka, after a course of 33 miles, the Khyber Pass, properly so called, ends. It here opens upon the beautiful and fertile plain of Jellalabad, 80 miles long by about 40 wide. Some 10 miles across this plain there stands the town of Jellalabad, surrounded by its fine fields and fruit gardens. Passing Jellalabad, the Khyber route to Cabul is continued

up the narrow valley of the Cabul river, and alternately over stony plain and fruitful field, till it reaches Gandamak, a village lying in the pleasant valley of the Surkh or "Red River." It was here, at a distance of 63 miles from Cabul, that in 1879 the treaty of Gandamak was signed. Immediately beyond, the narrow winding defiles of Jagdallack begin, and extend for 21 miles. It was in the Jagdallack passes that, in 1842, Elphinstone's unfortunate army lost all discipline, and was finally reduced to a mere handful of about 100 men, who, with the single exception of Dr. Brydon, were cut to pieces at the village of Gandamak. In one part of the Jagdallack passes, the path, shut in by high precipices, narrows to less than 4 yards. Through this defile our panic-stricken army fled



The Khyber Pass.

in 1812 until they were stopped by a barrier of timber and prickly holly-oak, which had been raised by their treacherous foes across the neck of the gorge; and here soldiers and camp followers were indiscriminately massacred. Even when the treaty of Gandamak was signed, nearly forty years after, their bleaching bones were still to be seen. The gorge to Tezin, 13 miles, is more open, but here commences the Koord Cabul Pass (13 miles), which resembles very closely the most difficult of the Jagdallacks. On each hand rise precipitous cliffs, piled one upon another, without a tree or a trace of vegetation. A torrent dashes along the bottom, fringed in winter with a border of solid ice. Scarcely a ray of the sun can penetrate into this dismal gorge, while a chill wind whistles through it as if

from an Alpine glacier. The stream has to be crossed twenty-eight times in the 13 miles, and when Havelock rode down in October, 1839, the water dripping from his cavalry cloak froze into icicles a foot long, which pulled off buttons by their weight. It was in the Koord Cabul that the Afghans made the most terrible havoc with Elphinstone's men, and it fitly deserves the significant name by which it has since been known—"the Valley of the Shadow of Death." In the 16 miles which remain of the road to Cabul the country gradually opens out, and is broken and rendered difficult chiefly by the innumerable water-courses with which the Afghans irrigate their little patches of cultivable land.

We have dwelt the more fully upon the characteristics

of the Khyber route, because it will afford a good general idea of the natural difficulties of traversing the mountain barrier which must be crossed by any one entering India upon the north-west. Geographically one of the most important, the Khyber route is beyond comparison the most interesting historically, having been the one chiefly used from earliest times by the conquerors of India. Under the treaty of Gandamak the British frontier was advanced up to Jellalabad, and some portion of the Khyber Pass is still occupied by us.

The Kurram Pass, or Valley, being the direct road from Bannu to Ghazni, has been for centuries looked upon as one of the principal routes across the Soliman Mountains. Until 1879, however, it was never believed that Cabul could be menaced by an army coming through this route. The natural difficulties in reaching the crest of the pass (known as the "camel's neck") at Shutar Gardan are very great, but not to be compared to those beyond. From Shutar Gardan to Khushi is a tortuous craggy mountain path for full 15 miles, with frightful steepes, boulders to be blasted, and torrents to be temporarily bridged; and in the war of 1879-80 nothing astounded the Afghans so much as the fact of Sir F. Roberts descending swiftly upon Cabul, with army and artillery train, through this supposed impracticable pass. The Shutar Gardan crest overlooks from a great height the fair Logar Valley, at the northern end of which, 40 miles distant, stands the city of Cabul.

The Gomul Pass—so named after the Gomul Plain, near the Indus, upon which it debouches—has more particularly a commercial interest, for during many centuries it has been the great trade route between India and Central Asia. It is the route employed by the Povindahs, or trading tribe of Afghanistan, whose remarkable enterprise will presently be noticed.

The Saughar, or Drug Pass, is the most southerly of the important passes entering *direct* into Afghanistan from the Indus valley—as the Bolan, more southward still, is in Beloochistan. The pass opens into the Solimans in front of the fort of Mangrota, and was formerly a much-used military and commercial highway from Mooltan to Candahar and Ghazni. It was the route chosen by Prince Muhammed, son of the Emperor Shah Jehan, in his expedition to recapture Candahar from the Persians. The prince led an army of 104,000 men, exclusive of camp followers; but not succeeding in his enterprise he returned by the same pass into India.

The Bolan Pass is about 500 miles south of the Khyber, and is one of the most interesting of all the routes into Afghanistan. It is the main avenue between Candahar and India, and was the first of the Afghan passes of which the British troops may, by their permanent occupation of Quetta in 1877, be said to have taken possession. Though, however, a main route into Afghan territory, both the pass and Quetta itself are in Beloochistan. The opening to the defile is 5 miles north-west of the town of Dadur, and the route leads in a north-westerly direction over the mountain chain by a succession of narrow valleys and rugged gorges. The Bolan River, rising near the head of the pass (5000 feet above the Dadur entrance) flows through it, and supplies water along the whole route, with the exception of one stage, where it has an underground course. The length of the pass from Dadur is 60 miles, towards the end of which the hills for 8 miles on either side close in until only three or four men can ride abreast; while the limestone cliffs tower up to a great height. The gorge opens out into a narrow valley, succeeded by a plain about 20 miles broad, on the further side of which stands the town of Quetta. Previously to its occupation by British troops, the pass was, like most other places, infested by robber tribes; but its chief danger now is from the Bolan

torrent, which, in the season of freshes, rises suddenly and pours through it as if down a precipice. In 1841 a Bengal detachment was thus lost, with all its baggage, having been overtaken by a sudden flood. Somewhat to the north of Quetta is the district of Pishin, assigned by the treaty of Gandamak to British occupation. It affords an improved position for our troops as regards sanitation and provisioning, and effectually commands the Bolan Pass, while rendering access to Candahar easy and rapid.

Having entered Afghanistan by the passes either of the Soliman or Hindu-Kush Mountains, we arrive at a series of lofty table-lands. The central one, that of Ghazni and Candahar, is bounded on the east by the Sir-i-Koh Mountains, and on the west by another range. It is a strip of land varying from 20 to 100 miles in width, and elevated, near Ghazni, to the extraordinary height of 9000 feet, but much lower towards the south. The valleys in this tract have a very good soil, and are well cultivated. As the quantity of rain which falls on this region is small, the lands require irrigation in order to be productive, but the rivers are small and cannot yield a large supply. To obtain a sufficiency of water the inhabitants construct a kind of aqueduct, by which the water of a hill or rising ground is brought out at its foot in a rivulet, to be disposed of at the pleasure of the farmer.

The southern table-land, which descends towards Beloochistan, has a central road leading from the Bolan Pass to the Khojak Pass, about 5000 feet in height. In this table-land the country is rugged and sterile, and cultivation is but scanty. The western table-land, which reaches to the confines of Persia, presents most of the same features, though not so boldly developed.

Rivers.—The most important river of Afghanistan is the Cabul (the ancient *Kophes*), which rises in the Unai Pass, near the source of its rival the Helmund, and receiving the drainage of the southern slopes of the Hindu-Kush on the left, and the northern water shed of the Sufed-Koh on the right, joins the Indus at Attock after a course of about 300 miles. Its largest tributaries are the Logar from the south, the Panjshir, Akshang, Kumar, and Landai from the north; the Kumar or Chitral river being the longest of these. From the opposite side of the Koh-i-Baba the Hari-rud (or river of Herat) runs westward past Herat, and turns northward through the marginal heights of the plateau to descend into the Turkoman desert in the north, and there to be drawn off in irrigating canals. Its north and south course forms the boundary with Persia. The Helmund (*Ftymandari*) rises in the angle formed by the inclination of the Koh-i-Baba and Paghman ranges, and after flowing first south-westerly, then westerly, and then north-westerly, for a course of over 700 miles, discharges by several mouths into the great Seistan swamp. The river is swollen out by the melting snows of the mountains in May and June, but shrinks at other seasons to a narrow channel.

Other rivers of Afghanistan are the Kokcha (famous for its neighbouring mines of lapis lazuli); the Kunduz river or Akseria (both of these being tributaries of the Oxus); the Murghab, which rises in the Koh-i-Baba and Western Sufed-Koh and flows into the Kara Kum desert north-west of Merv, after a course of about 450 miles. The Khashrud, Farah-rud, and Harut-rud, which rise in the southern slopes of the Sir-i-Koh and flow into the Seistan Lake, are all crossed by the different routes between Herat and Candahar. The Lora, Zhoib, Gomul, and Kurram are other streams of importance, the three last draining into the Indus.

The Seistan swamp, or Hamun Lake, which receives the waters of the Helmund, is a large expanse of lagoon on the borders of Eastern Persia. At ordinary seasons it reaches through a length of 70 miles, and is to a great

extent dry and grass-covered, its edges being marked only by reed beds and clay cliffs.

Climate.—The table-lands of which we have spoken vary from 3000 to 9000 feet in height, and the climate of a region so diversified in elevation naturally presents extremes: the heights are very cold, the deep valleys very hot. The Emperor Baber remarked of Cabul, that at one day's journey from it you may find a place where snow never falls, and at two hours' journey a place where snow almost never melts! As a whole, the climate is dry, cool, and bracing. The year is divided distinctly into seasons of spring, summer, autumn, and winter, the last beginning in December, when the streets of Cabul are blocked with snow, and all business is at an end for three months. Cabul enjoys a moderately warm summer; but at Jellalabad, in the same valley lower down, the heat of June becomes intolerable. Burnes, in 1840, left the wheat harvest in progress at Jellalabad, and found the crop at Gandamak, only 25 miles distant towards Cabul, but 3 inches above the ground. All over the province of Candahar the summer heat is intense; snow seldom falls on the plains or lower hills, and when it does it melts at once. At Herat, though 800 feet lower than Candahar, the summer is more temperate, and the climate altogether is one of the most agreeable in Asia. Three years out of four at Herat it does not freeze enough for the people to store ice; yet it was not very far from Herat, and could not have been at a greatly higher level (at Kafir Kala, near Kassan), that in 1750 Ahmed Shah's army, retreating from Persia, is said to have lost 18,000 men from cold in a single night.

The people have by no means that immunity from disease which the bright dry character of the climate and the fine physical aspect of a large proportion of them might lead us to expect. Intermittent and remittent fevers are very prevalent; between July and October the mortality from fever and bowel complaint is great. Stone is frequent, eye disease is very common, as are also hemorrhoidal affections and syphilitic diseases in repulsive forms.

Productions.—Although by far the greater portion of Afghanistan is a region of desert, rocks, and inaccessible mountains, it is interspersed with several well-watered and fertile valleys, yielding all the ordinary crops and the finest fruits and vegetables in abundance. The valley of the Cabul river is the most important part of the country; to the south is the fertile district of Logar, drained by the river of that name, a tributary of the Cabul; to the north is the Koh-i-daman, also fertile and highly cultivated; and to the east is the valley of Jellalabad. There is also an exceedingly rich and level tract in the vicinity of Herat and Candahar.

The grains cultivated are wheat, barley, peas, beans, maize, rice, and some other grains of Hindustan, as jowary, klana, musoor, bajra, moth, moong, ood, and murlwa. The most common vegetables are carrots, turnips, radishes, lettuce, cauliflowers, onions, garlic, melons, and cucumbers, with a few others from Hindustan. Madder is extensively grown on the central table-land; and turmeric, asafoetida, and many other useful plants grow luxuriously. The country is especially rich in timber, the slopes and ravines of the Hindu-Kush, as well as many of the lower ranges of hills, being generally covered with primeval forests of pine and other trees. Besides all the Indian cereals and the hundred varieties of the melon and cucumber kinds known to Asia, the castor-oil, tobacco, cotton, madder, and other valuable economic plants of the East, there are also found the fruits and flowers of Europe. The olive, mulberry, oak, cedar, walnut, and pine flourish, with all our orchard trees. English vegetables are in every bazar, and in the country-side the rose, jessamine, and hyacinth grow wild.

The most important of the domestic animals are the sheep. Goats are nearly as numerous, and some of them yield a fine and remarkably soft down, which grows at the root of the hair; the hair is long and usually jet black, but the down is of a shade more or less intense. Horses, mules, and asses are plentiful; camels and cattle less so. The cats of Cabul are distinguished by their long silky hair, and are known under the name of Persian cats, though very few of them are found in Persia, and none are imported from that country. These cats are exported in great numbers from Cabul, where the people encourage the growth of the hair by washing it with soap and combing it. Of wild animals, wolves, leopards, and hyænas are the most common.

Afghanistan contains considerable mineral wealth. Gold, silver, and copper are found in various parts; some of the Afghan iron is believed to be nearly equal to that of Sweden, and is largely exported to India. Lead, salt, alum, and saltpetre are also among the natural products of the country. Whole cliffs of lapis lazuli occur among the rocks.

Inhabitants.—Afghanistan is not a homogeneous state, peopled entirely by Afghans under the name of one sovereign. The name is merely a convenient geographical expression for a country which contains some districts almost entirely Afghan, many in which the Afghans form part of a mixed population, like the Turks or Greeks in Bulgaria or Roumelia, others in which the Afghan soldiery rule by force an alien race, and also large tracts in which the Afghans have very little, if any, authority. Exclusive of Beloochistan, Kafiristan, and Afghan-Turkestan, as being semi if not quite independent, the population of Afghanistan is about 5,000,000; and of these about 2,000,000 are true Afghans, speaking for the most part their peculiar language Pushtu, of the same family as Sanskrit, though essentially distinct, and being Mohammedans of the orthodox "Sunni" persuasion. They are divided into clans, the principal of which are the Duranis, Yusufzaes, Ghilzaes, Momands, Afridis, &c., each of these being again subdivided into many smaller tribes. The Hazaras, Einaks, and Waziris are the principal of the Pathan or non-Afghan tribes. Some of these speak Persian, profess the "Shiah" Mohammedan faith, and hold their own so well that no Afghan can pass through their districts without permission. Generally speaking, however, the Afghan is certainly the dominant power, being the strongest clan of any, and commanding more support from the semi-independent tribes than any other section. In the country there are also settled a considerable number of Hindus, Persians, Armenians, &c.

The origin and descent of the Afghans is, according to native historians, from the Jews who were carried captives by the Babylonians to the Ghore range, between Herat and Cabul. They call themselves Bani-Israel, "Sons of Israel," claiming descent from Saul, and taking their name from his grandson Afghana; but the theory of their Hebrew origin, based on this tradition, is doubted, for their language has no relationship to any of the Semitic dialects, but is clearly a member of the great Aryan family. Among the higher orders the language, dress, and manners of the Persians predominate. The national costume of the lower orders is a pair of dark cotton loose trousers, a large shirt ("camiss") worn over the trousers, reaching down to the knees; a low black silk or cloth cap, with lappets or sides, having a gold brocaded top or crown; a pair of brown or untanned leather half-boots, and in the cold season a large well-tanned sheep-skin cloak ("portin"). In the east the Hindustan costume is adopted. Afghan females are generally fair and handsome, and their costume, when at home, consists of a loose shirt (chemise), like those worn by the men, but rather longer, and made of finer material, richly ornamented with a small bright-

coloured silk hood; and when they go abroad, which is not often, they completely envelop themselves in a *boorku* (a long white veil, with eyelet and breathing holes), which conceals the whole of their person. All unmarried women wear white trousers, and their hair loose. The women are considered like currency; wives are purchased, and in cases of crime the penalty is oftentimes paid in the fair sex.

The men, when at home, pass much of their time smoking tobacco or inhaling the smoke from hemp, bang, or gunjah, which produces the most powerful and illusory kind of intoxication known—even calming the horrors of hydrophobia—and has a most extraordinary effect on the human constitution. Snuff is taken quite as an article of luxury. Gambling and wine are prohibited, but both are freely, if sometimes secretly indulged in, so far as they can be afforded. The Afghans are partial to singing, and particularly addicted to story-telling. One of their chief amusements is hunting, which sport they carry on like the Scottish “tinkal.” Horse-racing is conducted on a large scale, as no less than twenty or thirty horses start at once, and proceed over a distance of from 10 to 20 miles.

All the principal towns, such as Cabul, Ghazni, and Candahar, are inhabited largely by Persians and Hindus. The Afghans are nearly all officers, soldiers, and priests, and scorn to be traders or shopkeepers. The houses of the better classes are large, with numerous courts and halls, while those of the common people are of one story, each containing a single room, about 20 feet long by 12 broad, with little ornament and scarcely any furniture.

The Afghans, as a race, are handsome and athletic, often with fair complexion, flowing beard, and highly aquiline features. Both the men and women often have features of Jewish cast—a trait also met with amongst the Armenians and some other Aryan races. The inhabitants are inured to bloodshed and discord from infancy; and though at one time hospitable and chivalrous, little reliance can now be placed on the *Ung-du pooshtanneh*, or “honour of the Afghan name.” Unscrupulous, treacherous, vain, insatiable, and passionate in revenge, they will satisfy this feeling in the most reckless and cruel manner. The spirit of their character and institutions was tersely expressed by an old man to Elphinstone, who had urged the advantage of quiet and security under a strong king—“We are content with discord, we are content with alarms, we are content with blood; but we will never be content with a master.”

Industry and Commerce.—The chief articles manufactured for export are silk, woollen stuffs, sword-blades, and fire-arms, from Herat and Candahar. Felts are extensively manufactured at Candahar for carpets, cushions, bedding, horse-clothing, &c.; and a variety of woven goods are made from the wool of the sheep, goat, and Bactrian camel. Rosaries and charms are made at Candahar, from a sort of chrysolite, and largely exported, especially to Mecca. The manufacture of *postins*, or prepared sheep-skin pelisses, is chiefly promoted by its adoption as a winter dress for the army of the Panjab. Carpets of an excellent quality are made at Herat, their prices ranging from 10 to 1000 rupees. A recent traveller enumerates the following as the chief industrial occupations for home produce at Candahar:—Jewellers, gold and silver smiths, booksellers, bookbinders, stationers, makers of kullumdauns (a sort of inkstand and pen-case, of which every man who can write has one), seal engravers, sellers of armour, sellers of shields (these shields are of buffalo's or rhinoceros hide), gunsmiths, sword-cutlers, polishers of steel, sellers of bows and arrows, sellers of glass ornaments for women, three descriptions of shoe-makers, boot-makers, button-makers, silk thread sellers, gold wire and gold thread sellers, saddlers, farriers, painters, fruiterers, cooks, soup-

sellers, tobacconists, druggists, perfumers, sellers of sherbet and of fulloleh, confectioners, embroiderers, and people whose business is to sew ornaments on clothes of all descriptions, from jewels to spangles.

There are but few roads for wheel carriages in Afghanistan, and little is done to facilitate communication—none of the rivers being even bridged, except in the towns. The conveyance of merchandise is effected by beasts of burden. Camels are mostly used in the level countries, and mules or asses in the mountainous districts. Nearly all the land commerce existing between India on one side, and Persia, Turkestan, and China on the other, must be carried through Afghanistan. Of these lines of communication the most northern goes by way of Loodianah, Lahore, Attock, Peshawur, to Cabul, on the way to Bokhara. A middle line leads from Lahore to the table-land, where it branches to Ghazni and Candahar. A southern route reaches Candahar from the mouth of the Indus, and then passes westward into Persia. An active commerce is carried on between Herat and Meshed and other towns in Persia; and several caravans go annually from Cabul to India and Bokhara. The productions of Afghanistan reach India and many other parts to a large extent by means of the singular tribe of warrior-traders known as *Povindahs*—from the Persian *parvinda*, a bale of goods. At a particular time every year an immense caravan is formed, in which are included endless camel-loads of all the varied saleable productions of the country, and the women and children of the tribe. The Gomul Pass is the chosen route, and through the hostile tribes who here invariably assemble to intercept and molest them, the *Povindahs* fight their way. Arriving on the Gomul plain, near the Indus, the tents are pitched, and here the women and children remain, while the men go with their merchandise to Mooltan, Lahore, Benares, and other parts of India. In April the *Povindahs* assemble again for the return journey, taking back European and Indian goods. There is serious work in the pass as the great caravan returns, and the *Povindahs* seldom arrive in their native plains without the loss of numbers of their tribe. Their trade amounts to about £1,500,000 annually, and its survival in the face of such obstacles is very remarkable.

History.—Afghanistan was known to the Greeks under the name of *Ariana*. It formed part of the old Persian empire, with which it passed into the hands of Alexander the Great. During the last century it has several times been the scene of much anarchy and confusion, in consequence of the claims of various competitors to the throne. In 1824 three of them divided the country among them—Dost Mohammed taking the Cabul district, Shah Mahmood that of Herat, and Futeh Khan that of Candahar; the former sovereign, Shah Soojah, having been deposed and expelled from the country.

Dost Mohammed, the most powerful of the three leaders, addressed a letter to Lord Auckland, in May, 1836, which was the forerunner of British interference in that quarter; the Afghan professed to desire the friendship of the British, while the governor-general suspected him of complicity in certain alleged designs of Russia and Persia on our Indian empire. Sir A. Burnes was sent on a mission to Cabul in 1837, which resulted in a resolution on the part of Lord Auckland to oppose Dost Mohammed and reinstate Shah Soojah.

Then commenced a busy scene of military operations. In October, 1838, a proclamation of war was issued from Simla against Dost Mohammed. A British force of 25,000 men was soon ready for the expedition, which was to advance towards Cabul by way of Shikarpoor, the Bolan Pass, Quetta, and Candahar. Between Shikarpoor and the Bolan Pass is a broad desert; and Sir Willoughby Cotton, in February, 1839, prepared to cross this desert

with an army of about 10,000 men, accompanied by no fewer than 80,000 undisciplined camp followers. The army reached Candahar in April, having suffered much in their long march of 1000 miles from Ferozepoor. The Bombay army, which suffered still more severely, joined the former at Candahar early in May.

After having established Shah Soojah in a precarious kind of sovereignty at Candahar, the British, under Sir John Keane, set off in July for Ghazni, 230 miles distant. After storming this town, Sir John advanced upon Cabul, which was captured on the 7th of August. Dost Mohammed fled from the country: Hyder Khan, one of his sons, surrendered to Sir A. Burnes, and Akbar Khan, another son, was compelled to give up Jellalabad to Colonel Wade. Eight thousand troops were then detached to remain at Cabul to support Shah Soojah, and the bulk of the army returned to India. Throughout nearly the whole of 1840 and 1841 there were insurrections against the British and Shah Soojah, on the part of the Afghan chiefs, and although Dost Mohammed surrendered to the English in November, 1840, and went quietly to live in India, yet the country remained in such an unsettled state that the presence of from 10,000 to 16,000 British troops were deemed necessary. In November, 1841, matters reached a crisis. The Afghans surrounded Cabul, and before the close of the year Sir A. Burnes and Sir W. M. Macartney had both been murdered and the British had agreed to abandon Cabul and return to India. On 6th January, 1842, they set out, and their retreat was one of the most disastrous events ever recorded in British history. Harassed incessantly by the Afghans, all order and discipline were lost, and ultimately, out of a total number of 26,000 soldiers, camp followers, women, and children, one man only escaped to carry the dismal tidings to General Sale, who still held his position at Jellalabad. Ghazni was afterwards captured by the Afghan leader Akbar Khan, but Candahar and Jellalabad were retained, and some additional forces having been sent from India, Ghazni and Cabul were recaptured by the British, and Akbar Khan was totally defeated. After these victories the British forces were withdrawn, and it was believed that the Afghans had been deprived of all power to combine against the government of India. This expectation, however, proved to be fallacious, for in 1846 the Afghans, under Dost Mohammed, formed an alliance with the Sikhs, and some severe engagements took place between these allies and the British. After the defeat of the Sikhs at Guerat 21st February, 1849, Dost Mohammed fled to Afghanistan, and his impression of the British power was such that during the Indian Mutiny of 1857 he rendered valuable indirect assistance by preventing any invasion of territory in that quarter. This able ruler died in 1863, and his sons immediately commenced a war of succession, which lasted for several years. The British government ultimately espoused the cause of the youngest son, Shere Ali, who conquered both his brothers after his own prospects had become well-nigh desperate. Up to 1872 Shere Ali was chiefly guided in his policy by his eldest son Yakoub Khan, but in that year a palace intrigue ousted Yakoub from his place, and Shere Ali nominated Abdullah Jan, his youngest son, as his successor. In 1878, when war seemed probable between England and Russia in consequence of events arising out of the Russo-Turkish war of that year, Shere Ali received a Russian mission at Cabul. As he subsequently declined to receive any corresponding British mission, war was declared against him, and the advance of the Anglo-Indian army into Afghanistan was quickly followed by the collapse of the Afghan military forces, and the flight and death of Shere Ali. Yakoub Khan, who succeeded him, promised to recognize the supremacy of British influence in his country, and by the treaty of Gandamak a portion of the line of passes through

the Soliman range and the district of Pischin, to the north of Quetta, were added to British territory, and a British resident, Sir Louis Cavagnari, was appointed to reside at Cabul. Within less than two months, however, of the signing of this treaty, the British resident, together with his escort almost to a man, were murdered; the new Ameer fled, and a general rising of the Afghan tribes took place. In the campaign which followed the safety of the British forces was more than once seriously imperilled, and though in the end they were victorious and gained possession of Cabul and Candahar, a change of government in England led also to a change of policy, and they were withdrawn to India, so that in 1882 a few points only of the celebrated "scientific frontier," the acquisition of which had been the real cause of the war against Shere Ali, remained in British hands. Meanwhile a civil war had been raging in Afghanistan between Ayoub Khan and Abdurahman Khan, aspirants for the throne, and the latter in the end proved victorious. Negotiations were opened with him by the Indian government, and in 1883 it was decided to allow him an annual subsidy on condition that he would be guided by the advice of the Indian government in all the foreign affairs of his country. Early in the following year the attention of the British government was directed to the acquisitions of territory which Russia was rapidly making in the direction of the Afghan frontier, and in May, 1884, the British ambassador at St. Petersburg, Sir Edward Thornton, was instructed to revive an old Russian proposition made in 1882 for the definition of the Afghan frontier. After some negotiation it was agreed by both governments that the definition should be entrusted to a joint commission of British and Russian officers. In the autumn of the year the British delegate, Sir Peter Lumsden, was appointed and set out on his mission, but no corresponding movement was made on the part of the Russians, and during the winter portions of the debatable land were occupied by them in force. During the months of February and March, 1885, the negotiations between the two governments became very animated, and some important conferences were held between the Ameer Abdurahman and Lord Dufferin, the governor-general of India, at Rawul Pindi, where the Ameer had arrived on a visit of state. While the Ameer was in India, news arrived that General Komaroff, the Russian commander, had suddenly attacked the Afghans at Pendjeh and defeated them with great slaughter, and war between Great Britain and Russia at one time appeared inevitable. Active preparations were made both in England and Russia, but in the end a compromise was effected and arrangements were made for marking out a frontier line which should be recognized by all parties interested. Few persons, however, regard the arrangement as permanent, and there can be no doubt but that the condition of Afghanistan will be a source of anxiety to the Indian government for many years to come.

AFGHAN TURKESTAN. Beyond the great range of the Hindu-Kush, from the northern slopes of those mountains to the Oxus and the Central Asian desert, there lie several states which, politically, are part of Afghanistan, though in a geographical sense separated by mountains rising far into the region of perpetual snow, with passes ranging from 12,000 to 13,000 feet and upwards. It is to be supposed that the rulers of Afghanistan attach some importance to these outlying and almost inaccessible possessions or tributary states, having shown at various times great determination to retain them. During a period of civil war among the Afghan chiefs the Turkestan states asserted their independence, but in 1850 Dost Mohammed commenced a series of campaigns which, lasting to 1859, resulted in effectually reuniting the whole of them under his sway. Almost the only recognition, however, now exacted by the rulers of Cabul is the

rendering of homage on certain occasions and the payment of an annual tribute. The population of all the states referred to does not much exceed 600,000.

Badakshan is the most easterly, and also by far the largest of the states north of the Hindu-Kush range included within Afghan Turkestan. It lies for the most part in the deep valley of the Kokcha river, a tributary of the Oxus. This valley is so fertile that rice and wheat are exported to the surrounding countries, whilst its pastures maintain large numbers of horses, cattle, and famous camels. Within this territory beautiful lapis lazuli, sapphires, and rubies are also found in abundance. Its chief centres of population are Jirm, a cluster of hamlets in the valley of the Kokcha, and Faizabad, on the Oxus.

Wakhan, higher up the valley of the Oxus, on the south-western border of the Great Pamir steppe, is a province tributary in its turn to Badakshan. There is a considerable transit trade, the easiest approach hither from India being by the Chitral Valley and over the Baroghil Pass at its head.

Kunduz, the state next Badakshan westward, was formerly an independent khanate, now tributary to Afghanistan. Its valley is richly productive of grain and fruits.

Balkh (ancient, *Bactria*). We here approach the borders of the great Turkoman desert, and the low country becomes bare and stony, though the upper valleys are well watered and fertile. The natives are Usbeks of the Shialh sect of Mohammedans, and Balkh, their capital, now a ruinous place, has had a great history. It is still called by the Orientals Uem-ul-Bilad, or the "Mother of Cities." In the beginning of the period of the middle ages it was the great centre of Mohammedan civilization in Central Asia, and was then an immense city fully 30 miles in circuit. It was the birthplace of Zoroaster, and the capital of the Greek kingdom founded by the successors of Alexander the Great.

Andkhui and *Maimana* are the other two states, both, especially the latter, containing a warlike Usbek population, partly settled in villages, partly nomadic.

A FORTIORI. The argument *a fortiori* is one which is evidently stronger than another already allowed to be conclusive.

AFRICA. *Progress of Discovery.*—The name "Africa," which is no doubt of native origin, was probably first introduced into Europe by the Romans, who limited it, however, to one of their African provinces which comprehended the city of Carthage. The real name for the whole continent, both in the Greek and Roman writers, is *Libya*. Herodotus states that it is surrounded with water, except at the narrow neck now called the Isthmus of Suez; and one reason for his belief was apparently the story that the continent had been circumnavigated by the Phœnicians in the reign of Pharaoh Necho (as he is called in 2 Kings xxiii.), king of Egypt, between B.C. 610 and 594.

From the tables of Ptolemy, the Greek geographer, it appears that the coast of western Africa was known, probably through the navigation of the Carthaginians and the Romans, as far as to 11° N. lat. The powerful state of Carthage, which employed so many elephants in war, and carried on so extensive a commerce, could not be ignorant of the countries south of the Great Desert. The elephant was perhaps not an inhabitant of the Atlas regions, though Pliny states that it was, and therefore must have been brought to Carthage from Central Africa; while the articles of commerce which the interior now furnishes to the coast of Tripoli were commodities in which the Carthaginians used to deal, such as slaves, ivory, and gold. The Carthaginians had extensive elephant stables and grounds near the city. Pliny gives an account of Suetonius Paulinus,

A.D. 41, crossing the great mountains of the Atlas, and going some distance south; and in Ptolemy we have the narrative of a Roman officer, Maternus, who set out from the neighbourhood of Tripoli, and went a four months' march in a southern direction. This route must have brought him into the latitude of Timbuktu, and into the neighbourhood of the Chad; and if the story is true, the great river now commonly called the Niger was probably thus known to the Romans.

The Fortunate Islands (now the Canaries) were known to Ptolemy, and he reckons all his eastward distances or longitudes from them, or from some one point in them; for he does not appear to have known anything accurately as to the relative position of these islands. And as coasting voyages had considerably extended the knowledge of the east coast of Africa, without, however, showing any termination of the land, Ptolemy concluded that the southern parts of Africa joined the eastern parts of Asia, and thus he converted the Indian Ocean into an inland sea.

The Greek and Roman writers mention the following remarkable African animals with which they were acquainted: the crocodile and the hippopotamus, both in the Nile and the rivers of Western Africa; the gnu, or camelopard; the elephant; the two-horned rhinoceros, and the ostrich. With the exception of the hippopotamus, all these animals were at different times seen in the Roman capital. The camel is not mentioned as being found in Africa by any ancient writer, we believe, except Herodotus, and it is therefore concluded that it was introduced into this continent by the Arabs.

As the Arabs became acquainted with the country south of the Great Desert as early as the seventh century, and had for many generations been in the habit of traversing the desert by means of caravans, their authority precedes that of the writers of Western Europe in point of time. The works of the Arab geographers, with respect to Africa, are worthy of attention, for though often vague and unsatisfactory they still show, in some directions, a more extensive knowledge than the Greeks and Romans have left on record; and indeed their accounts have been sometimes singularly confirmed by the inquiries of our own age.

Up to the beginning of the fifteenth century the only portion of Africa known to Europeans was the northern or Mediterranean shore. It was in 1415 that Prince Henry, son of John I., king of Portugal, set on foot the first of a remarkable series of exploring expeditions, by which the entire coast of Africa was eventually made known to the modern world. Prince Henry died in 1463, up to which time the explorers had only reached as far as Sierra Leone. Zeal for African discovery, which the prince had maintained in the face of long-continued ridicule and opposition, was now become a national passion, and the work of prosecuting what had been so well begun was taken up by the government. Bartholomew Diaz obtained charge of three ships, and was commanded to pursue his course southwards till he arrived at the extremity of the continent. This object he attained, without at first being aware of his success, and we distastefully also the eastern side of Africa, sighting the remarkable promontory which has since then received the various names of the Lion of the Sea, the Head of Africa, the Cape of Tempests, and the Cape of Good Hope.

Portugal was by this time steadily rising to the highest place as the greatest maritime power in Europe, and Lisbon was the centre of all that was speculative and adventurous in maritime discovery. It was whilst living there, employed in constructing charts and maps, that Columbus conceived his grand idea of sailing westward to the Indies of Marco Polo; and to qualify himself for his great enterprise, he undertook several voyages along the African coast. Having here acquired the necessary experience, he

unfolded his larger scheme to the Portuguese king, who, however, decided against the venture, which ultimately found patrons in Ferdinand and Isabella of Spain. The startling tidings by and by arrived that Columbus had found a new world, and a little zest was added to Portuguese explorations by the hope that the newly-discovered lands might be reached by an eastern voyage round Africa. Vasco de Gama and others were despatched on new voyages with this view; and although these particular hopes were disappointed, the Portuguese were by these means able, in 1506, to claim the credit of having traced the coast line from the Straits of Gibraltar to the southern extremity of the Red Sea, a distance of more than 10,000 miles.

In addition to this acquaintance with the coast, the Portuguese in course of time also acquired some little knowledge of the inland country, partly through the establishments which they soon began to form at different points, and partly by means of information brought to them from other parts by the natives. One of the vague legends of mediæval times was that of a rich and magnificent kingdom, the sovereign and priest of which came to be known in the west as Priest John, or "Priester John," and the locality of whose kingdom was sometimes supposed to be in Asia and sometimes in Africa. The reports concerning it had made a profound impression in Europe, and one of the main objects kept in view by Portuguese expeditions was the discovery of this mysterious personage—of whom we need only say here that whoever he may really have been, he was, from the first intercourse with Abyssinia, taken to be the emperor of that country. It was in the course of this quest that Abyssinia was visited by two emissaries of King John, and close relations were begun between Portugal and this part of Africa, which lasted for several centuries.

Having been the first Europeans to familiarize themselves with Africa, their present possessions there are naturally rather extensive. On the eastern coast they extend for nearly 1000 miles, from Cape Trio to Ambriz, embracing Angola, Loanda, and Benguela. There is no definite inland limit, the dominant Portuguese living almost entirely in a few coast towns. The government has always been utterly corrupt, and is a mere system of extortion and robbing of the produce and labour of the native negro tribes. It is significant that though the Portuguese have had settlements here since 1488, they have not to this day constructed a single highway or passable road in their whole possessions.

Thus being the case, it is perhaps not surprising that, after the Portuguese had for centuries occupied positions all round the African coast, the world was scarcely anything the wiser concerning the vast interior of the continent. So profoundly dark and mysterious was the subject, and so conflicting and uncertain the meagre details received at times concerning it, that in 1788 a few scientific and learned persons formed themselves into a society for promoting the exploration of Inner Africa. This "African Association" was formed in London, and under its auspices the first really earnest attempt to open up the continent began. The necessarily slow progress, however, together with repeated failures, was very discouraging; and in 1831 the young African Association was merged in the more general "Geographical Society," but not before its agents, Houghton, Mungo Park, Horneman, Burchardt, and others had added materially to our knowledge, often at the sacrifice of their own lives. During the present century exploration over the ground has been carried on with wonderful energy, and within the last fifty years more has been done to unravel the great African mystery than during 2000 years before.

The earliest of these exploring expeditions, commenced at the instance of the African Association, were directed

towards the Soudan, or Country of the Blacks—the great expanse in the widest part of the continent, from the Sahara Desert to about 7° N. lat. The second series of explorations, initiated by Dr. Livingstone in 1849, ranged from the colonized portions of South Africa to a few degrees north of the equator, the country of the Zambesi and the Congo. The third series had for their object the discovery of the long-hidden sources of the Nile and of the great lake system of Eastern Central Africa, and had their origin in reports, received in 1845, from some missionaries stationed near Mombas, on the eastern side of Africa, to the effect that a series of large lakes were to be found at no great distance in the interior. We will, in the order here indicated, briefly glance at the results achieved by the noble host of devoted men who, in many cases at the cost of their own lives, have opened up the "dark continent" to the enterprise of the colonist, the merchant, and the philanthropist.

With Mungo Park, strictly speaking, commenced the era of unceasing efforts to penetrate the interior. The Niger may be called Mungo Park's river. The Senegal was said to spread away into Central Africa past Timbuktu; but Park, making his way inwards from the west coast, discovered a great river, known as the Joliba, flowing past Timbuktu indeed, but in a direction exactly contrary to the course of the Senegal. He explored the countries bordering on the river, determined the southern confines of the Sahara, and returned in 1797. In 1805 this adventurous traveller took a second journey to the same regions for the purpose of descending the Joliba to its mouth. He is ascertained to have passed Timbuktu, and to have reached Boussa, where he was killed by the natives. The problem of the Niger was solved in 1830 by Richard Lander, who, taking it up about the point to which Park had reached, and where the river was known as the Joliba, or Quorra, traced it to its delta in the Bight of Biafra. In 1822 three Englishmen, Clapperton, Oudney, and Denham, setting out from Tripoli, crossed the Great Desert, first reached the state of Bornu, and saw the great lagoon known as Lake Chad. Oudney died in Bornu, and Clapperton, on a second voyage, died at Socattoo, near the Niger. In 1826 Major Laing also crossed the desert from Tripoli, and first saw the famed city of Timbuktu, which had been known by report to Europeans since the fourteenth century. He transmitted some brief notices of the city, where he spent several weeks, but was murdered on his return through the desert. Then the Frenchman Caillié brought back an account of this great centre of commerce, having reached Timbuktu from the western coast, and returned northwards through the Great Desert to Morocco. In 1849 an expedition was arranged by Mr. James Richardson with a view to conclude commercial treaties with the chiefs of Northern Africa, and also to obtain, if possible, the suppression of slavery. Mr. Richardson, accompanied by Dr. Heinrich Barth and Dr. Overweg, reached the scene of his proposed labours, but died before anything could be begun. Overweg also fell a victim to his exertions, but Barth continued his explorations till 1856. During this time he traversed in many directions almost the whole of the Northern Soudan, and upon these great journeys we are still dependent for the greater part of our knowledge of the central negro states. Much of Barth's ground was traversed in 1865–67 by Gerard Rohlfs, and still further in 1869 by Dr. Nachtigal, who was commissioned by the King of Prussia to carry presents to the Sultan of Bornu, in acknowledgment of that potentate's aid to former travellers. Dr. Nachtigal afterwards revisited the same districts, and in his journeys from 1874 to 1880 investigated the Eastern Sahara, the central mountainous country of Tibesti, and found an outflowing river from Lake Chad, which had previously been supposed to be a terminal lake.

It was not until after these arduous journeys that any distinct conception could be formed of the political condition of the great fertile belt of Central Africa which lies south of the barrier of the vast Sahara. Then came to light the great series of Mohammedan states which lie between Darfur on the east and Senegambia on the west—Wadai, Bornu, and the Felattah states. The powerful state of Bornu, in which the descendants of Arabs are the ruling race over the far more numerous negro inhabitants, had its first Moslem ruler as early as 1086, and seems to have reached the zenith of its power in the eleventh century, when its limits extended over Fezzan on the north. The states lying westward—Sokoto, Gando, Masena, Timbo, with many minor ones—owe their foundation to the remarkable negro race of the Fulahs or Felattahs, who appear to have been converted to Mohammedanism as lately as the middle of the eighteenth century, who have been carrying their religious wars of conquest

eastward over the Niger basin since 1802, and who are still extending their influence further into the pagan domain of central Negroland.

The second series of explorations were commenced by Dr. Livingstone, and relate chiefly to the great lacustrine system of Southern Central Africa. In the summer of 1849, the doctor, who, as an agent of the London Missionary Society, had laboured and travelled in the countries immediately north of the Cape Colony since 1840, began those remarkable journeys in the interior of Southern Africa, which continued till his death in 1873, and which have given to him the first place amongst African discoverers. The finding of Lake Ngami, the central point of the continental drainage of South Africa, was the great discovery of the first year. Between 1851 and 1853 Livingstone journeyed in the land of the Bechuanas, and was the first European to embark upon the upper waters of the Zambesi, and to trace this great river to its source



Victoria Falls, Zambesi River.

in the little Lake Dilolo. From the Makololo country he proceeded westward across the continent through twenty-two degrees of latitude to Loanda, on the west coast, where he appeared in 1854. Returning in 1855-56 by a somewhat more northerly route, he recrossed the continent; descended the Zambesi to its mouth at Quilimane, discovering the wonderful Victoria Falls of the river on his way. In a new journey in the Zambesi region in 1859, Dr. Livingstone, accompanied by Dr. Kirk, traced the Shire river, a northern tributary of the Zambesi, to its outflow from the Nyassa, the most southerly of the great African chain of fresh-water lakes. A subsequent effort to find a way to his newly-discovered Lake Nyassa from the Rovuma river failed, the river proving unnavigable; but the undaunted explorer returned in 1861 to the Shire river, and, carrying a boat past its rapids, launched out to explore the whole length of Lake Nyassa. In 1866 Livingstone commenced his last and grandest expedition, the object being to determine the course of the waters

between lakes Nyassa and Tanganyika. It was upon this journey that, soon after passing the head waters of one of the Zambesi tributaries, he ascended some high land, and came upon the Chambeze river. Continuing in a north-westerly direction he reached what was for some time known as Lake Liemba, but which proved to be only a southern extension of Tanganyika. Turning south-west again, he found that the two large lakes, Moero and Bangweolo (or Bemba), formed part of one great system connected by the Chambeze river (also named in different parts of its course the Luapala and Lualaba) in a basin south and west of that of Tanganyika. In 1869 Livingstone arrived at Ujiji, on the eastern shore of Lake Tanganyika, and after a brief rest here crossed the lake, penetrated the dense tropical forests and swamps of Manyema country, in the heart of the southern portion of the continent, then struck again the vast river Lualaba, and during 1870-71 traced it flowing out of the Lake Moero and heard that it passed through a third great expansion, Lake Kamalendo.

He also learned that the river received a great tributary from the south-westward, which also expanded into a vast lake, and this Livingstone named, in anticipation, Lake Lincoln. The fate of the great traveller, from whom no news had been heard for more than two years, now became a matter of the greatest anxiety among all classes in Europe and America. Expeditions were organized to search for him, one, generously fitted out at the expense of the proprietor of an American newspaper, being placed under the command of Mr. H. M. Stanley. This gentleman made a bold march from Zanzibar to Ujiji, and was fortunate enough to meet the veteran traveller there, just returned from Manyema, broken down by the severity of the task he had accomplished, and in need of everything. Livingstone was naturally cheered by the world wide interest evinced in his behalf, and after a few pleasant weeks spent together, Stanley left him recruited in health, well supplied with stores and followers, and determined to further prosecute the search, in order to clear up all doubts respecting the ultimate course of the great Lualaba river. This, however, Livingstone was not destined to accomplish. The efforts already made had proved too heavy a tax upon his strength, and on the 3rd May, 1873, by the shores of his own Lake Bemba, he laid down his life for the land he had loved with such rare and devoted ardour. No man felt more acutely, or exposed more unsparingly, the horrors of the slave trade; and the ruling idea of his life was so to open up Africa to legitimate trade with the world that the inhuman traffic would become unprofitable if not impossible.

The full results of Dr. Livingstone's travels can never be estimated by the immediate outcome of his own experience. His lifelong devotion to Africa, and his published works on the subject, gave such a lustre and impetus to African travel as nothing else could have imparted. The expeditions of both Cameron and Stanley—contributing as they did so enormously to geographical knowledge—were undertaken in the first instance to search for Livingstone; and the cordial relations which the great explorer invariably maintained with the tribes amongst whom he sojourned, undoubtedly smoothed the way for his numerous followers, as well as set them an example of how great results may be attained without exciting hostile feeling among the native people.

Bonchant Cameron, who was placed at the head of one of the expeditions organized to search for Dr. Livingstone, was met, soon after starting from Zanzibar, by a few natives, who, faithful to the last, were bearing the body of their beloved master to the coast for transmission to England. Further search was therefore unnecessary, but Cameron resolved to go on, and endeavoured to take up one of the doctor's unfinished tasks in following up the great Lualaba. Careful examination of the west shore of Tanganyika led Cameron to believe it had an outlet by the Lukuga creek into the Lualaba—a conclusion afterwards fully confirmed; but he failed in actually connecting the two. He then traced the Lualaba as far as Nyangwe; but finding himself unable to follow its course beyond, he turned south-westward, and performed a very interesting journey over previously unexplored ground right across the continent to Benguela. Much of the field traversed by Dr. Livingstone was, in 1879, carefully examined by a Portuguese botanist, Serpa Pinto, and by an Austrian naturalist, Dr. Emil Holub, with excellent results in their own several spheres of research. The special task, however, which Dr. Livingstone was engaged at the time of his death was, in 1877, taken up by Mr. H. M. Stanley, the American who had already distinguished himself by so opportunely finding and relieving Dr. Livingstone in the very heart of Africa. The expedition, embracing several hundreds of porters, carriers, &c., was

one of the largest and most complete which ever entered upon African exploration, and certainly one of the most successful. Stanley not only circumnavigated the Victoria Nyanza, which forms the head waters of the Nile, but, descending in a south-westerly direction, he struck the Lualaba, and followed it up most bravely, in spite of difficulties often of an extremely dangerous nature. After tracing it throughout a great bend which the immense river performs to the north of the equator, Stanley achieved one of the greatest triumphs of African discovery by proving conclusively the identity of the Lualaba with the Congo, having followed the flow of the waters across the entire continent, from the point where Livingstone left them to the Yellala Falls. Stanley ultimately emerged with the remains of his expedition at Loanda, on the west coast. ("Across the Dark Continent," London, 1880.)

The intense interest excited by the discoveries of Livingstone, Cameron, and Stanley resulted in the formation of the "International Association for the opening up of Africa," with the King of the Belgians at its head. This society was joined by representatives of all the principal states of Europe, and under its auspices several expeditions were despatched. The formation of the association was the means of stimulating the Royal Geographical Society to renewed action; and in 1878 a new expedition, under the leadership of the young geographer Mr. Keith Johnston, was directed to proceed from Dar-es-salaam across the hitherto unexplored country between that place and the north end of Nyassa, and thence to the south end of Tanganyika. This work was successfully accomplished, but at the expense of Johnston's life, who succumbed to dysentery at the village of Beholuhu, not far from the coast. The work then fell into the hands of his assistant Joseph Thomson, who, though only twenty-one years of age, did not flinch from the arduous and dangerous task. On reaching Tanganyika, instead of returning, he proceeded north along the western shores of the lake, visited the Lukuga and then Ujiji, from which he returned to try and find his way back to the south end of the lake by way of the Congo valley. After a series of hairbreadth escapes among the savage Wa-rua, he was forced back to the Lukuga, and was there picked up by the missionary Mr. Hore, who conveyed him to the south end of the lake, where Mr. Thomson's men were camped, with the exception of thirty who had accompanied him north. The return homeward was then commenced through the country of Fipa, visiting for the first time Lake Hikwa, which he rechristened Leopold, and finally reaching the great central Arab trading station of Unyanyembe, whence his way was along well-known routes to the coast, which he regained after an absence of fourteen months. Mr. Thomson in this journey traversed nearly 4000 miles of country, of which almost two-thirds was over hitherto unexplored ground, and could boast of the feat of bringing back every man who left the coast with him, with the single exception of one who died of hemorrhage.

Perhaps, however, the most practical expedition arising out of Mr. Stanley's important discovery with respect to the Congo was one in which this gentleman himself took the lead, and made a most vigorous effort to turn his discovery to useful account. Under the direct auspices of the King of the Belgians Mr. Stanley proceeded again to the Congo in 1879, with the view of taking such steps as might enable this vast river to be used as a main artery of communication into the interior of the continent, which is not miserable desert, as was formerly supposed, but a fertile expanse of well-watered country, teeming with useful produce. The Yellala Falls stop the Congo navigation at about 200 miles from the sea, but Mr. Stanley proceeded to construct a practicable road along the mountainous shores of the river, past the obstructing

cataraets; and in spite of very serious difficulties this was accomplished by 1883, a substantial highway with an average width of 15 feet being carried 230 miles along the north bank of the river beyond Stanley Pool, and therefore well into the navigable upper waters. By means of a good service of carriers along this road, steamboats on the upper reaches of the river, and a chain of stations across the continent, it is expected that an immense trade-route will be opened up which in course of time may result in inconvertible good to Africa, and go far to realize Livingstone's humane idea. Mr. Stanley returned to England in 1881, considering that he had then completed his work of establishing satisfactory trading stations from the mouth of the Congo to Stanley Pool, a distance of 1400 miles. This work had been accomplished in name of the International Association for the Exploration of Central Africa, of which the King of the Belgians was the head. In 1884 this association was recognized by the government of the United States as an independent power, in virtue of its African possessions, while on its part it guaranteed freedom of trade to all nations with the districts it had opened up. See CONGO.

The third series of explorations were connected with the special object of finding the source of old Nile—a long-sought but seemingly ever-baffling mystery which had puzzled the world since the time of the oldest of the Pharaohs. Expeditions on an imperial scale had at times been sent to trace the river up to its source, but the task had exhausted them long before the hidden "fountains" were reached. A station of the Church Missionary Society was established near Mombas, on the east coast of Africa, in 1845, and the zealous missionaries in charge of it began to make exploring journeys into the interior. Thus, in 1849, the Rev. Mr. Rehnmann discovered Kilimanjaro, the snow-clad monarch of African mountains; and his companion, Dr. Krapf, on a more northerly route, came in sight of a second huge mountain, named Kenia, also snow-clad, though directly beneath the equator. Frequent reports reached these missionaries of vast lakes in the interior beyond the mountains they had discovered, and their information awakened a peculiar interest in this at home.

In 1857 Messrs. Burton and Speke, under the auspices of the Royal Geographical Society, set out from Zanzibar to ascertain the truth with respect to the great inland lakes, which had been reported by the Mombas missionaries. The travellers took a route direct west, through the country of Uvumwezi, over well-cultivated plains in the first 200 miles, succeeded by others arid and comparatively sterile. The westward course led, as may be seen by reference to our map, to the beautiful lake Tanganyika, deeply embosomed among towering hills, and now seen for the first time by Europeans. After a short stay at Ujiji the travellers returned to Kaze, the capital of Uvumwezi, whence, Burton being ill, Speke started northward to find another lake, of which the two had heard during their journey. After proceeding some 200 miles due N., Speke came upon a great expanse of water known as Lake Ukerewe, and expressed a shrewd conviction that he had discovered the source of the Nile. The idea, however, was not generally entertained, one of its greatest opponents being Speke's fellow-traveller, Burton; and in order to settle the question Speke resolved upon a second journey, and in 1862, together with Captain Grant, started from Zanzibar by a more northerly route, and reached Ukerewe at its northern end. From this lake, which Speke now named "Victoria Nyanza," they found the infant Nile flowing over the "Ripon Falls," about 12 feet in height; and Speke's first surmise was triumphantly vindicated by tracing the outflowing river to the White Nile at Gondokoro. Here the travellers were met by Baker, who in 1861 also identified

himself in a marked manner with the great river by discovering the Luta N'zige ("locust"), or Albert Nyanza, a large lake nearly in the same latitude as the Victoria, through the southern end of which the Nile flows on its way to Gondokoro. From 1869 to 1880 Sir Samuel Baker and then Colonel Gordon were engaged by the Khedive of Egypt in establishing military posts up the Nile and in the adjacent country, a vast extent of which was in this way brought under the rule of Egypt. This territory was always a source of loss to Egypt, and since the revolt of the inhabitants in 1883-84 has been one of the greatest embarrassments of England in connection with that country. Stanley, in the course of his great journey towards the Congo in 1877, did good service to geography by embarking upon the Victoria Nyanza, voyaging completely round it, and obtaining accurate information of its extent and general characteristics.

We have here indicated only the main routes pursued and the most striking successes achieved within recent years by travellers in Africa. It would be impossible within the limits of our space to detail all the good and useful work accomplished by others than those mentioned; for since the "Journals" of Dr. Livingstone aroused such intense interest in the land to which he devoted his life, a stream of explorers, from America as well as Europe, has poured into Africa in all directions, surveying its rivers, ascending its mountains, collecting its flora and fauna, circumnavigating its lakes, establishing trading depots and mission and postal stations, and giving accounts of their varied experiences to the world. A company at Zanzibar quotes rates for carrying merchandise or escorting travellers to Tanganyika or Victoria Nyanza; while a splendid transport service until recently enabled tourists to ascend the Nile from the delta almost to its source—anyone with ample pecuniary means being thus able to accomplish that which baffled the greatest of the Pharaohs. Thus the exploration of the vast continent is slowly advancing year by year, but with earnest and unceasing progress. There are still great gaps in the network of routes accomplished by travellers, and there is yet room for important geographical discoveries; but sufficient is known to enable us to present at least tolerable outlines of the principal physical features of the continent.

Coast-line and Geographical Description.—Africa is one of the great continental divisions of the globe, and the third in point of extent. In form it may be compared to an irregular triangle, with its base N. and its apex S. Its entire length, from N. to S., or from Cape Blanco on the Mediterranean, to Cape Agulhas, 100 miles S.E. from the Cape of Good Hope, is 5000 miles; and its extreme breadth, from E. to W., or from Ras Jeddahoon (Cape Guardafui) on the Indian Ocean, to Cape Verde on the Atlantic, is about 1800 miles; but owing to its great irregularity of form, and extreme narrowness towards the south, its entire area does not exceed 12,000,000 square miles. Its coast-line is about 16,000 miles, but offers few facilities for commercial purposes; it presents no broad, navigable estuaries, no secure and capacious harbours, no landlocked bays or gulfs. Its principal indentations are the Gulf of Guinea, on the west coast; the Gulf of Sidra in the north; the Bights of Benin and Biafra, which are minor indentations of the Gulf of Guinea; and Delagoa and Sofala Bays, on the east. The main river mouths are those of the Nile on the north; the Congo, Niger, Senegal, and Gambria, on the west; and the Zambesi, on the east.

The principal projections are likewise few in number. On the north we meet with Capes Blanco and Sparte; on the north-west with Cape Verde; on the south with Cape Agulhas; and Cape Guardafui on the east. The islands lying off the African coast, which is mostly barren, un-

healthy, and inhospitable, are of no great importance. Off the mouth of the Rio Grande cluster the Bisagos; in the Bight of Biafra lies Fernando Po, with its towering peak; Prince's Island, St. Thomas, and Ascension are situated in the Gulf of Guinea. The islands of Zanzibar, Pemba, and the groups of the Bazaruta and Quereniba, are on the east coast, as well as the rich and picturesque island of Madagascar, which is separated from the mainland by the Mozambique Channel, about 250 miles wide at its narrowest part. Among the African islands must also be included Socotra, the Comores, the Cape Verde, the Canaries, St. Helena, and Ascension Islands.

Africa is bounded on the north by the Mediterranean Sea, which separates it from Europe; on the north-east by the Red Sea or Arabian Gulf, which divides it from Asia; on the east by the Indian Ocean; and on the west by the Atlantic. It is thus one immense and sea-encircled area of remarkable continuity of outline, except at its north-eastern extremity, where the narrow neck of land called the Isthmus of Suez joined it to Asia. Even this has been cut through by means of a deep and navigable ship canal, thus turning Africa into one vast island. See SUEZ CANAL.

General Survey.—As a whole the continent may be regarded as a vast plateau, bounded round by maritime ranges which form the seaward edges of the interior tablelands. If we begin in the extreme north-eastern corner, where Africa joins on to Asia, we find the land rising immediately west of Suez, at the southern end of the ship canal, to a height of 2600 feet, named Jebel Attaka; from this we may follow a chain of heights rising abruptly all along the western shores of the Red Sea till we reach the high edge of the Abyssinian highland, 7000 to 8000 feet above the sea, over which the British expedition marched to Magdala in 1868. Further on southward we reach that part of the margin of the plateau on which the snow-capped Kaila (18,000 feet) and Kilimanjaro (18,700 feet) rise between the Indian Ocean and the great lakes; then the Livingstone Mountains (9000 feet), which wall in Lake Nyassa; and in the furthest south the Drakenberg range, which rise steep and wall-like, facing the Indian Ocean, and leading round to the terraces which form the Cape Colony. On the western side also the mountains form a lofty group, and terminate on the Atlantic coast in rocky and dangerous cliffs, where the Table Mountain, with its cloud-crowned summit, 3582 feet high, is at once a warning and a landmark for mariners. Terraced ascents from the sea-coast to the borders of the interior plateau present themselves all along the western side of the continent from the Cape Colony to the head of the Bight of Biafra. Around the Guinea coast also, beyond the low delta of the Niger, as far as Cape Verde, the plateau edge slopes up immediately from the sea, and has received the general name of the Kong Mountains in this part. In Morocco the bordering maritime heights are taken up again by the Atlas range (Mitsin, 11,400 feet), and are continued along the Mediterranean by the plateau of Barbary, by the range called the Jebel es Soda, or Black Mountains of Tripoli, and by the heights of Barca further east, bringing us again to the delta of the Nile.

Within the border of maritime heights which we have been tracing, all southern Africa may be regarded as a vast plateau, at a general elevation of about 3000 feet above the sea. Two of the most prominent interior ranges which rise from this portion of the plateau are those called the Mishinga Mountains, which seem to have an east and west direction, separating the wide basins of the Congo and the Zambesi rivers, and the Mountains of Ulegga, a mass of heights which extends along the north-western sides of Lakes Tanganyika and Albert Nyanza, separating the Nile basin from that of the Congo.

Northern Africa, between the higher southern plateau

and the mountains of Barbary on the Mediterranean coast, is generally lower, or at an average elevation of from 1000 to 1500 feet above the sea, though the plateau formation remains the same. The prominent lines of heights known within it are those which extend from the Marrah Mountains of Darfur, between the Nile basin and that of Lake Chad, north-westward through the mountain land of Tilesti, in the centre of North Africa, to the series of plateaus occupied by the Tuarej tribes south of the plateau of Barbary. A remarkable volcanic belt is traced through the Bight of Biafra in the line of the islands of Annobon, St. Thomas, Prince's, and Fernando Po (10,190 feet), to the high Cameroonian Mountains (13,760 feet) on the coast of the mainland, and thence inland on the same abrupt line to Mounts Atlantika and Mendif, midway to Lake Chad in the interior.

It results from the general plateau form of the continent that its lowlands are confined almost exclusively to the narrow fringes of the coast, and to the alluvial flats which have been pushed out seaward by one or two of its rivers, such as the delta of the Nile on the Mediterranean coast, that of the Zambesi on the margin of the Indian Ocean, or of the Ogowe and Niger towards the Atlantic. Elsewhere lowlands occur only as hollows sunk or bedded within the lower plateaus of the North African region; of these the most remarkable is that which lies south of the plateau of Barbary in Tunis, separated from the head of the Gulf of Gabes only by a narrow belt of rock, and containing within it several lagoons or salt marshes, called "shott" or "shores" by the Berbers, which lie depressed some 50 feet below the level of the Mediterranean. The largest of these depressions, "Shott Kebir," extends inland about 250 miles from the Gulf of Gabes. If the rocky barrier, 10 miles wide, separating the sea from this depression, could be cut through, a great lake as extensive as Ontario might be formed; and the evaporation from its surface would tend, perhaps, to restore fertility to the waste lands around it, but it would be too shallow for purposes of navigation. Within the limestone plateau of the Libyan Desert, between Barca and the Nile valley, there also occur a number of isolated hollows, of less extent than "Shott Kebir," the beds of some of which have been found to be nearly 100 feet beneath sea-level.

One of the most remarkable and best known regions in Northern Africa is the great Sahara or Desert—the Sahara-belama, or Waterless Desert, as the Arabs call it—a region of singularly sombre and oppressive barrenness.

"A region of drought, where no river glides,
Nor rippling brook with osler sides;
Nor sedge pool, nor bubbling fount,
Nor tree, nor cloud, nor misty mount
Appears, to refresh the aching eye,
But barren earth, and the burning sky,
And the blank horizon round and round."

It intervenes between the northern and central portions of the continent, as if to exclude all international communication; extends full 3000 miles westward, from the Nile valley to the Atlantic; is 800 to 1000 miles in breadth; covers an area of not less than 760,000 miles; and, without the aid of the camel, would be impassable to man. It is even prolonged far into the Atlantic Ocean in the form of sandbanks. This desert is alternately scorched by heat and blighted by cold. An east wind blows over it for nine months in the year; and at the equinoxes it gathers up into a terrible hurricane, which drives the sand before it in vast scorching clouds, produces the darkness of night at mid-day, and overwhelms caravans of men and animals in one general and inextricable ruin. Then the sand is heaped up in waves ever varying with the blast; even the atmosphere is of sand. The desolation of this treeless waste, boundless to the eye as the ocean, is sublimely

awful; the dry heated air burns like the vapour of a furnace; the setting sun glows through the mist like a volcanic fire; and at times the fell wind of the desert breathes like the blast of death. Numerous salt-lakes lie to the north, and even the springs are of brine; the ground glitters with thick saline incrustations, and the particles, borne aloft by the whirlwinds, sparkle in the sun like diamonds.

From the prevalence of easterly winds it results that as the traveller journeys westward he finds the sand increasing in depth, and accumulating in less broken tracts. Should ever the winds of the west become predominant, Egypt would be overwhelmed by a deluge of sand, and all its civilization, and memorials of antiquity and strange barbaric life, disappear from the face of the earth.

The surface of the desert, however, is not wholly composed of sand; nor is it by any means a plain throughout, but for the greater part it rises into table-lands, interspersed with mountain groups of 6000 feet elevation, and probably more, and the term lower lands can only be applied to it in a general way, to distinguish it from the more elevated region to the south. The northern portion of the Sahara is that which has caused the whole desert to be pictured as one huge sea of sand. Immediately south of Tripoli and the plateau of Barbary there occurs a great belt of sand more than 2000 miles in length from east to west, and 200 to 300 miles wide. The interior of the desert, however, beyond this great northern sand barrier, has a very diversified surface, and consists in great part of table-lands, which are called "hammada" where they are strewn with sharp stones, and "serir" where they are covered with small pebbles. At the termination of the periodically filled water channels which descend from the higher grounds, or occasionally where springs well out upon the ground, the immediate neighbourhood is fertilized, and there are created those oases of verdure and leafiness which are the delight and often the salvation of the traveller. See SAHARA.

Passing over the great equatorial region towards South Africa, we come to a large tract of country corresponding in many features, though not in size, to the Sahara. The Kalahari Desert reaches from the Orange River to about the 20th parallel of south latitude, and is as deficient in moisture supply as its vast counterpart in the north. The gradation from the fertile grassy plains of the Transvaal and Orange Free State to the desert is a very gradual one, like that from the Soudan to the Sahara. Though there is no running water, and it is for the most part a dry sandy region, it is not altogether devoid of vegetation, which, where it occurs, consists of tufty grass and creeping plants, with deeply-buried bulbous roots. Like the Sahara, the Kalahari has its nomad tribes, consisting here of Bushmen, some of the very lowest types of human kind. They are of low stature, thin, and wiry; they never try to cultivate the land, and have no homes, but chase the antelope herds from place to place, lying in wait for them with bow and poisoned arrows.

At the Cape of Good Hope the African continent is about 700 miles broad, and terminates in three parallel ridges of mountains, the last of which is the highest, and abuts on the central table-land. These are respectively named the Sneenberg, the Zwellenduin, and the Zwarte or Black Range. All are fissured by precipitous deep ravines, which carry oceanwards the winter waters, and separated by longitudinal valleys, or *koroos*, the tiers or steps by which the table-land descends to the maritime plains. Beyond the Zwarte range are the wide undulating plains known as the Great Karoo. Throughout this tract, for a distance of nearly 200 miles, farms are few, for water is scarce, and the water-channels which furrow its surface are dry excepting after thunderstorms, or furnish only a

few brackish pools. The land here is treeless; in some parts stunted bushes are thinly scattered, and at most times of the year the prospect is arid and dreary. Yet, after rain, as if by enchantment, the whole plain is covered with a lovely green vegetation, with flowers of every hue. Some of the plains bordered by the sea partake of the same temporary aridity, though many extensive tracts produce an abundance of cereals, wines, fruit, and excellent pasture.

Rivers and Lakes.—The poverty of Africa in flowing waters was noticed in the earliest times, and has contributed as much to its long seclusion as the harbourless character of its coasts.

Over almost all the wide northern region of Africa, for reasons which we shall understand when we come to look at its climate, there is scarcely any permanently flowing river, except the Nile, which, however, draws its supplies from more favoured regions far in the south. The streams of the Barbary plateau in Morocco and Algeria are mere torrents, filled to excess during the winter rains, and dwindling down to a thread of water in the dry summer. Beyond the plateau, over all the vast area of the Sahara in the north, there is no constantly running stream, though the surface is furrowed by deep-cut "wadis," or water-channels, which quickly drain off any shower that may fall, and quickly dry again.

The streams of the Cape Colony, at the other extremity of the continent, have the same character as those of the Barbary plateau, finding their way to the sea through deep-cut gorges or "kloofs," flooding after the winter rains, and dwindling down almost to dryness after fair weather. Inland from the Cape Colony lies the Kalahari Desert, already noticed as corresponding to the Sahara in the north, and furrowed like it by periodically filled channels.

The broad central belt of Africa on each side of the equatorial region is, however, well supplied with moisture, and here accordingly we find great lakes and large flowing rivers.

The best known of the four great rivers of Africa, the Nile, has its highest great reservoir in the Victoria Nyanza, an expanse of fresh water occupying an area as large as Scotland, and crossed by the equator. From this it overflows by the Ripon Falls, 12 feet high, and flows north-westward, descending by the Karuma and Marhison Falls to where it joins the Albert Nyanza, which is a great backwater of the river, shut in by the high blue mountains of Ulegga. Its further course will be found traced under the article NILE.

The great river of West Africa, the Niger—discovered by Mungo Park—rises on the inner side of Mount Loma, one of the summits of the range which marks the edge of the plateau in this part of Africa, and flows, as the Joliba, north-east to Timbuktu on the border of the Sahara Desert, then running east and south-east, and changing its native name to Quorra, reaches the Gulf of Guinea through a great delta. See NIGER.

The Senegal and the Gambia, reaching the Atlantic north and south of Cape Verd, are important navigable rivers, the former in possession of the French, the latter dotted with British factories along its banks.

Just south of the equator, on the West African coast, the Ogowé river has pushed out a large mangrove-covered delta into the sea. About 70 miles above the head of the delta, the main stream—more than a mile wide—is formed by two branches, one from the east, named the Orembavolo or Okanda; the other from the south-east, named the Orembawango or Ngumie. Both of these streams are soon interrupted by falls and rapids; but a regular traffic is now maintained along the lower river to the French, British, and Hamburg trading stations on its banks.

Some way further south we come to the mouth of the greatest of African rivers, the Congo or Zaire, which

pours out such a flood of water into the Atlantic that the sea surface for many miles out is kept perfectly fresh. It is only since the journey of the explorer Stanley, in 1877, that the enormous proportions of this African river have been realized. Its head stream is the Chambeze, a river discovered by Livingstone, which rises in 10° S. lat., and which flows to Lake Bangweolo, south-west of Tanganyika. Its further course, first as the Luapula and then as the Lualaba, is shown under Congo.

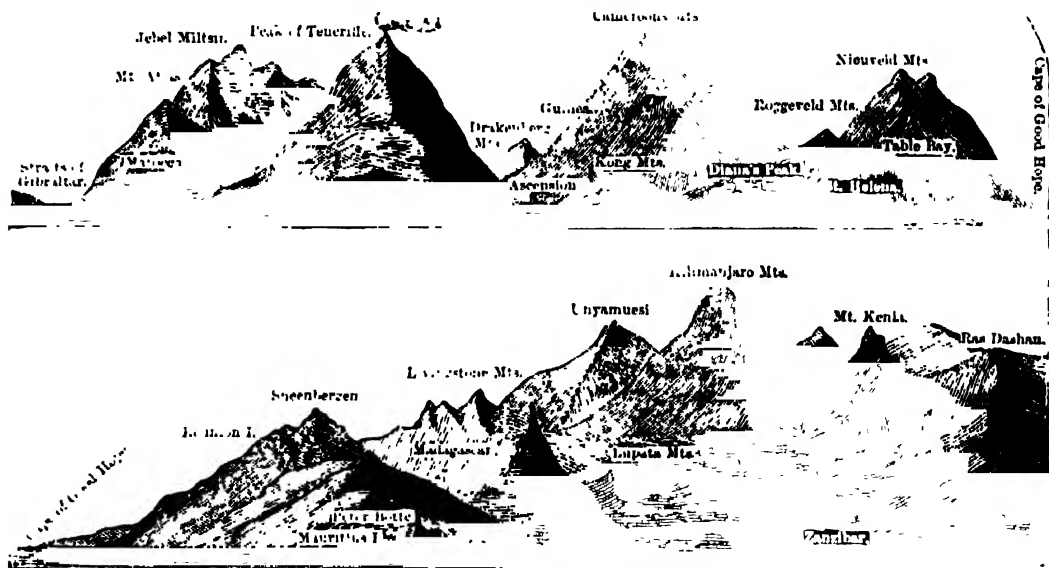
South of the Congo the Coanza is one of the most important rivers of the West African coast, as it affords a navigable way 120 miles from the sea, to where rapids interrupt its course. This part of it is now regularly traversed by steamers. The Nourse or Cunene, remarkable for the number of its crocodiles, is narrow and shallow, and quite unnavigable. The Orange, the boundary and also the largest river of the Cape Colony, is formed by the junction of the Vaal and the Nu Gariep, from the inner slope of the Drakenberg range. Immediately below the confluence of these two streams it is a much finer river

than lower down in its westward course to the Atlantic. It is then so obstructed by rapids and falls, and by the sandbank at its mouth, as to be of no value as a commercial highway. All along the north of Cape Colony it is hemmed in by precipitous walls of rock; and when swollen to an impetuous torrent it presents a very fine sight, especially at the great falls of Aughrabies midway in its course.

Opposite the basin of the Orange, on the eastern side, we come to the Limpopo, the second river in size of those which flow to the Indian Ocean from Africa. This is also a shallow and variable river, navigable only for about 60 miles from the ocean by small vessels.

Further north is the ZAMBESI, the chief river of East Africa. This great stream has one of its sources in the little Lake Dilolo, which lies on a ridge west of the Mushinga Mountains that separates the drainage of the Congo and Zambesi basins. From Dilolo the course of the Læba, as the upper river is named, is south-eastward to where it is joined by the Lecambye from the Mushinga range on the north-east. The united river then flows south and east-

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ward through the fertile Barotse valley till it reaches 25° E. lon., near which meridian it leaps down 100 feet by the magnificent Victoria Falls—called by the natives *Mosioutanya*, or “smoke sounding”—into a narrow zigzag gorge in the basalt rock. Thence the river flows north-eastward with impetuous current, and afterwards turns east, receiving the Loangwa from the north, besides other large tributaries. At the Kebabasa Rapids and in the Lupata gorge, where the river passes the margin of the plateau to descend to the maritime slope, its channel is considerably lowered. Below this the Zambesi winds south-east, and on the coast it forms a great delta which branches out 80 miles between the furthest apart of the channels into which it divides. The river is navigable to the Portuguese settlement of Tete, 260 miles from the sea. A few miles above the apex of the delta it receives the Shire river, the outflow of the great Nyassa Lake. The Nyassa has out a narrow trench more than 300 miles long from north to south, walled in by the high mountains of the Livingstone range, which rise almost precipitously to the height of 8996 to 9006 feet on its eastern slopes.

The Shire, flowing south from it, is interrupted in its course to the Zambesi by the Murchison Cataracts; but below these its channel is freely navigable for 100 miles to the great river.

The notable rivers of the east African slope northward of the Zambesi are the Rovuma, almost unnavigable; the Lufigi, Kingani, and Wami, reaching the coast opposite Zambar island; the Rufa, from Kilimanjaro; the Dana, from the snow-clad mountain Kenia; and the Juba river, which reaches the sea just at the equator from the mountains south of Abyssinia. In attempting to navigate this river the unfortunate explorer Baron Von der Decken was killed in 1865.

There remain to be noticed two rivers and lakes of the inland or continental drainage of Africa, which correspond remarkably with one another in their characteristics. The northern of these is the Shari river, and Lake Chad, which it supplies. The Chad is a great, variable, and shallow expanse of fresh water on the southern border of the Sahara, at an elevation of about 11,000 feet above the sea. In the dry season it has an area of about 10,000 square

miles, and then presents the appearance of an immense swamp, overgrown along the margins with reeds and papyrus, in thickets haunted by hundreds of hippopotami and clouds of wild-fowl. After the rains, however, it spreads out to a much larger area, and then sometimes overflows by a broad channel to a second depression called the Plain of Bodele, which lies 300 miles north-east of it. The southern river is the Tioje, with its lake Ngami, on the border of the Kalahari desert in Central South Africa, 2800 feet in elevation. The Ngami is generally about 300 square miles in area, but expands and contracts like the Chad with the rain and the dry season, overflowing like the former also at seasons of flood, by the Zonga channel, to a number of wide "pans" or depressions south-east of it.

Lake Tanganyika, a beautiful expanse of water 400 miles long, occupies a narrow mountain-walled trench like that of the Nyassa, between it and the Albert Nyanza. It lies about 2700 feet above the sea, and is very deep; the Malagarazi river from the east is the only large stream that flows to it. It was long regarded as a closed-in lake, and as such was considered to present one of the most remarkable problems of African hydrography. All other known lakes without outlet have salt or brackish water, since the salts brought to them by their affluents are left in the lake, which only loses by evaporation from its surface. Yet the waters of Tanganyika are perfectly fresh. Lieutenant Cameron, however, after carefully observing the Lukuga Creek, on the western side of the lake, thought that a solution of the mystery might ultimately be found in the fact of this creek being the outlet for the waters of Tanganyika. In 1879 Mr. Hore, who visited the Lukuga directly after the heavy rains, proved the correctness of Cameron's surmise, and found the waters of the lake being borne in quite a violent flood by this outlet towards the great stream of the Luabala.

Climate.—Africa is the most completely tropical quarter of the world. If we look at the map it will be observed that only its northern and southern extremities lie beyond the lines between which the sun passes vertically over the land, so that great heat is the chief characteristic of its climate; this, however, is reduced by the general elevation of the continent. Drought is the other great feature over all the immense area of Northern Africa; there north-easterly winds prevail, and these coming from cooler to warmer latitudes, and passing over the great continent of Asia, take up the moisture as they pass, and give the land its generally dry and barren aspect. In the far south also the corresponding south-easterly trade-winds are the most frequent; and these, expending the moisture they have gathered from the Indian Ocean on the higher outer margin of the continent, leave all the interior of South Africa deficient in rain-fall, and in parts almost as barren and dry as the Sahara in the north. The central region of the continent on each side of the equator is, however, well supplied with rain-fall, for the winds are drawn in thither from the ocean on both sides to that part of it which for the time lies beneath the heat of the vertical sun, and there the combined heat and moisture have raised a covering of richly luxuriant vegetation, and forests which may be compared with those of the East Indies. On the northern and southern borders of the continent—in the maritime districts along the Mediterranean, and of the Cape Colony in the south—the rain-supply comes in winter; but within the tropics the rains are obedient to the apparent movements of the vertical sun, and thus move gradually north and south over the central regions of Africa, to and fro across the equator towards each tropic during the year. The landscape of the continent thus presents a regular gradation from habitable lands on each extremity north and south to bare dry deserts, and from these through pastoral grass lands to the broad equatorial belt, of which

humid climate and luxuriant forest growth are the characteristics.

All the low coast lands of Africa are haunted by fevers, which are most malignant on each side of the equatorial region, where the spreading mangrove, sending down roots from its branches, forms a dense thicket along the sea margin and about the mouths of the rivers, causing stagnant lagoons within the coast-line, and gathering there a great accumulation of decaying vegetable matter, which forms a fetid black mud. Behind this low coast region, however, the high plateau lands of the interior have almost everywhere a healthy climate.

Botany.—The nature of African vegetation will be best understood by tracing geographically the changes it undergoes from a region which differs little from that of the south of Europe, to the singular flora of the Cape of Good Hope. To the traveller who passes from the south of Europe to Tangier, the appearance of the African coast presents nothing remarkably different from what he has left in Europe; and along the whole of the most northern shores so great a similarity continues to be preserved, that if it were not for a few striking objects he might fancy himself still in Spain or France. On this northern coast the date palm is first found; but its fruit does not arrive at such perfection as in Arabia, and it is chiefly valued as an ornament to gardens and houses.

The principal objects of cultivation in the Barbary States are a kind of wheat, the stems of which are solid and the grain horny rather than farinaceous; barley, which the Moors give their horses instead of oats; maize, durra, rice, tobacco, olives, oranges, and figs of the most delicious quality; pomegranates, grapes, and jujubes, together with sweet melons and water-melons.

As soon as the chain of the Atlas is passed the scene changes; the excessive dryness of the climate on the northern borders of the Great Desert is such that few trees except the date can maintain an existence.

Egypt exhibits an aspect intermediate, as it were, between the first and the last of these descriptions, but also presenting the general features of a tropical country. European plants begin to disappear. In the districts watered by the Nile we find all the richness of vegetation of the spring months of Barbary; abundance of rice, barley, and wheat; rich fields of sugar-canes; olives, figs, vines, and plantains that have been introduced; while in the hotter or drier, or more southern districts, the date lends a peculiar character to the scenery. In the richer parts of the country we find the acacias which produce gum arabic, large tamarisk trees, called *atle*, great quantities of the *senna* plant and other species, intermixed with various herbs belonging to tropical genera, all of which are either unknown or very rare in the more northern parts of Africa. Cotton, coffee, indigo, and tobacco are cultivated with the greatest success. At Thebes first begins to appear a third race of palms different from the date and the palmetto, namely, the forky-branched doom palm of Upper Egypt.

The deserts which occupy a large part of this continent, like inland oceans of sand, are scarcely inhabited by any plants except of the most stunted character. One of the most remarkable is a grass called *kasheia*, which wholly covers immense districts, and causes intolerable annoyance to the traveller by its prickly involucre; another is the *agool*, which furnishes a grateful food for the camel.

In the equinoctial parts of Africa all trees of European vegetation, and even the date tree itself, disappear. Where moisture exists in sufficient abundance to favour vegetation, the flora partakes in a certain degree, particularly on the east side, of the plants of India, but is to a much greater extent composed of species peculiar to itself. The landscape is characterized by masses of the unwieldy

baobab, the fruit of which affords the natives a grateful drink, huge cotton trees, the trunks of which project at the base into great buttresses, shrubs of richest verdure, large gramineous plants with branching stems, impenetrable thickets extending into the water, with thick groups of oil palms, sago palms, and others of the same majestic tribe. In some places the woods abound in pine-apples, which, although not natives of the continent, have established themselves as completely as in their native home in tropical America; the plains are often covered with immense quantities of the papyrus plant, to the exclusion of all others; and in the regions near the equator a new feature is introduced by the chandelier tree, which rises singly in the plains, and divides its grotesque branches into repeated forks, the extremities of which are crowned with long, rigid, channelled leaves, like those of the pine-apple.

With the general nature of the vegetation the species that are cultivated for the food of man also change. In the tropical regions of Africa we meet with the cassava, the yam, the pigeon pea, and the ground-nut; the papaw, the tamarind, and the nitta or doura tree; the Senegal custard apple, the gray plum, the safu, and the musanga, the seeds of which are as agreeable as hazel-nuts, and many others less common.

As we approach the southern point of this continent a new change passes over the face of nature; tropical forms disappear as they have formerly appeared, and we lose the scenery of the cotton tree, the baobab, the palm, and the chandelier tree; not, however, to find their places occupied by the plants of Barbary and the north, but to contemplate an order of vegetable products so different that their very genera had been previously unknown. Still the same wilderness of sand and drought occupies the centre of the country, but it is no longer covered with prickly grasses or waving thickets of papyrus. The karos of the Cape Colony are the residence of fleshy, leafless, distorted, shapeless tribes of stapeliæ, of mesembryanthemums, euphorbias, crassulæ, aloes, and other succulent plants, each holding to the soil by the weak support of a single wiry root, and feeding rather upon the dews of heaven than the moisture of the soil—a condition for which they are admirably adapted by the want or imperfect state of their evaporating pores, so that whatever humidity they are able to collect is parted with as slowly as the limited supply is furnished to them.

Such are the more prominent features of the vegetation of Africa. Its islands partake more or less of the nature of the flora of the adjacent continent, modified chiefly on the west side by the cooling breezes of the Atlantic, and on the east by the wide expanse of the Indian and Southern Oceans. In these spots we have usually a total absence of African sterility, in consequence of their insular position; and from their luxuriant vegetation we may judge what that of Africa would be if either nature or the skill of man could succeed in conducting rivers and streams to parts where are now only barrenness and drought.

Zoology.—As regards Mammalia, Africa is confessedly strong in feline animals, in Pachydermata, and antelopes. Though the lion is found in Asia, Africa is its stronghold; its range extends from the northern coast to the settlements at the Cape of Good Hope. The tiger is exclusively Indian, but leopards, panthers, and smaller feline animals are extremely numerous. With respect to the canine race, there are various species of foxes and fox-like animals, among which we may notice the fennec, besides the hunting dogs and true wild dogs. Of hyenas three species are well known, one of which, the striped, is common to the warmer parts of Asia, as Turkey, Persia, Syria, India, &c., as well as to Northern and Central Africa. In other Carnivora, as the aard-wolf, civets, genets, ichneumon, and species of

the weasel tribe, Africa is by no means deficient. It had long been believed that no species of bear inhabits Africa, but it is now ascertained that they are to be found in the range of the Atlas and the Tetuan Mountains; and Ehrenberg hunted a bear in Abyssinia, where it is called by the natives *Karrai*.

The indigenous Pachydermata are the elephant, the hippopotamus (two species), the zebra, the dauw, the quagga, and one or two allied species as yet imperfectly known; the wood-swine, and two species of masked swine; three species of two-horned rhinoceros, and a single-horned species; also the daman or byrax. Africa has no deer excepting along its northern border, where the fallow deer or a closely allied species exists, but is rich in antelopes, some of which tenant the wide karos and table-lands, others the woods and dense jungles, and a few the crags of the rocks. Some of the antelopes, as the canna, the koodoo, the oryx, &c., are very large and powerful; others, as the gazelle, the spring-bok, &c., are remarkable for their light and graceful forms, and the swiftness of their movements. Various wild buffaloes, powerful and savage, are peculiar to the African continent; some species of ibex inhabit the mountains of Abyssinia and Nubia; and the aoudad ranges the craggy heights of Barbary, Abyssinia, Tunis, and Northern Africa generally. The tall and graceful giraffe is found in Nubia, Abyssinia, and the adjacent countries, as well as in the more central regions and the districts of Kaffraria.

Of the Edentata, the great seat of which is South America, Africa possesses only a few species of manis, and the aard-vark. With respect to Quadrumana, as apes, monkeys, lemurs, &c., Africa has its fair share—especially if we include Madagascar, the stronghold of the true lemurs. The genera Troglydites, Papio or Cynocephalus, Inuus, Cercopithecus, and Colobus, are peculiar to Africa. Of these animals the most remarkable are the chimpanzee, a native of Benin, Congo, Angola; and the gorilla, whose habits were studied and first made known by Du Chaillu and Winwood Reade; the ferocious mandrill may also be mentioned.

Of the Cheiroptera, or bat tribe, the species are numerous, among which we may notice the gigantic fruit-eating bat or roussette, common in Madagascar and the Isle of France.

Africa does not abound in Rodents; it possesses, however, some interesting forms, as the leaping hare of the Cape, the jerboa, the porcupine, various species of coon-rats which burrow in the sandy tracts, several interesting forms of murine animals, hares, &c. Among the Insectivora may be noticed the Cape chrysochlore, the elephantorhinos, so called from its long and flexible nose, various species of hedgehogs, and in Madagascar the tenrec, a form allied to the hedgehog.

Among domestic quadrupeds the horse, the ox, the buffalo, the sheep, the goat, and the camel may be enumerated. It is in the northern and central regions that the camel and buffalo are used. Dogs are numerous, and in Mohammedan towns have no particular owners, but are tolerated for their utility. The domestic cat is rare.

Africa is the great winter retreat of many of our birds of passage, and particularly the swallow tribe, the quail, the cuckoo, &c. Along its northern boundaries there are many kinds of birds common also to Western and Eastern Europe, but Africa possesses its own peculiar species. Eagles, hawks, owls, and vultures are innumerable; as are also birds of most other kinds. Africa is, however, only sparingly supplied with those of the gallinaceous order; the genus Numida, comprising several species of Guinea-fowl, certain francolins, sand-grouse, and partridges, being the chief African representatives of this valuable group. Everywhere in the wide plains and deserts the ostrich rears his tall form, and "scorneth the horse and his rider."

The serpent-eating secretary-bird inhabits Southern Africa and Senegambia; parrots abound in the woods. The republican weaver-bird loads the branches with its nests; and brilliant species of the cuckoo tribe dart on rapid wings in chase of their insect prey. Of these, one species, the honey-guide, indicates to the Kaffre or Hottentot the hollow tree in which the bees have built their cells. There are no humming-birds, but brilliant sunbirds supply their place.

Reptilia—crocodiles, huge lizards, gigantic boas, tree snakes, deadly cobras, vipers, asps, &c.—are everywhere common; and Amphibia abound in the swamps. With the poison of some of the deadly species of reptiles the Bushmen anear the points of their arrows.

Insects of forms innumerable Africa contains in hosts. The locust, as in the earliest times, is still the scourge of the whole continent. By many tribes this insect is eaten, not only in times of scarcity, but as relished food; anciently it formed part of the diet of the Ethiopians. On the plains and in the woods the termites rear their huge dome-like structures of clay; and the zimb of Bruce, the zebule or fly, is still the plague of the low and cultivated districts along the course of the Nile and its tributaries. But most pernicious of all is the tsetse-fly, discovered by Livingstone in the countries around the Zambesi, whose bite is fatal to most domesticated animals. It is seldom found in the open country, but frequents the brushwood and reed-covered hills.

Minerals.—The great mineral treasure of the Sahara region in the north, and of a few other parts, is the salt, which in some districts is wholly wanting. Thus in the Abyssinian high land the salt, which is brought up in small blocks from the depressed salt plain on the Red Sea coast beneath, is so valued as to be used as a money currency; and in the native kingdoms of South Central Africa the salt districts are royal possessions strictly guarded. Metals seen nowhere very abundant. Gold is perhaps the most generally distributed, but is not now found at any spot in large quantity. The rivers of West Africa and the Transvaal gold-fields are perhaps the most productive. The gold coin formerly current in Britain took its name from the metal brought from the Guinea coast in the reign of Charles II. Iron is found in Algeria. Copper is the great mineral resource of the western districts of Cape Colony, and it is also found at Katanga, south-west of the Tanganyika Lake. The diamond fields, discovered in 1867, in the districts of the Vaal and Orange rivers north of Cape Colony, are steadily worked, and give fair returns. Under the name of Griqualand West the diamond fields form a province of the Cape Colony.

Inhabitants.—The whole number of people within the African continent can only be vaguely estimated, but probably exceeds 200,000,000. Owing to the vast extent of the regions within it which are scarcely habitable from the extreme dryness, the population is much less dense than that of Europe or of Asia, but it is in a corresponding degree greater than that of America or of thinly-peopled Australia. The density of the population is regulated naturally by the character of the landscape. In the fertile extremities lie the well-peopled states of Barbary and Egypt in the north, and of the Cape Colony in the south. South of Barbary are the sparsely-inhabited regions of the Sahara and of the Kalahari, and then we reach the populous central area of the continent from the Soudan to the valley of the Zambesi.

The mountain regions of the Atlas, which by their position and character hardly belong to the continent of Africa, as well as the entire shores of the Mediterranean from the Straits of Gibraltar to the Cyrenic regions, have been subject to the invasion of conquerors ever since the earliest period of history. The Phœnicians, Greeks, and Romans,

Vandals and Goths, and Arabs from Asia, have at different periods possessed portions of these regions, and mixed their blood with that of previous races. The Arab invasion has produced the most permanent effects, and that nation now occupies the most fertile parts of the Atlas region and the towns on the coast, being generally known to us here by the incorrect appellation of Moors. The subsequent conquests of the Turks (also an Asiatic race), did little more than establish a despotic power on a few isolated spots under a military chief. But it seems not unlikely that, after all these violent revolutions, the Berbers and Shellahs of the Atlas Mountains are the descendants of the primitive inhabitants, and that they retain their original language in all its substantial parts.

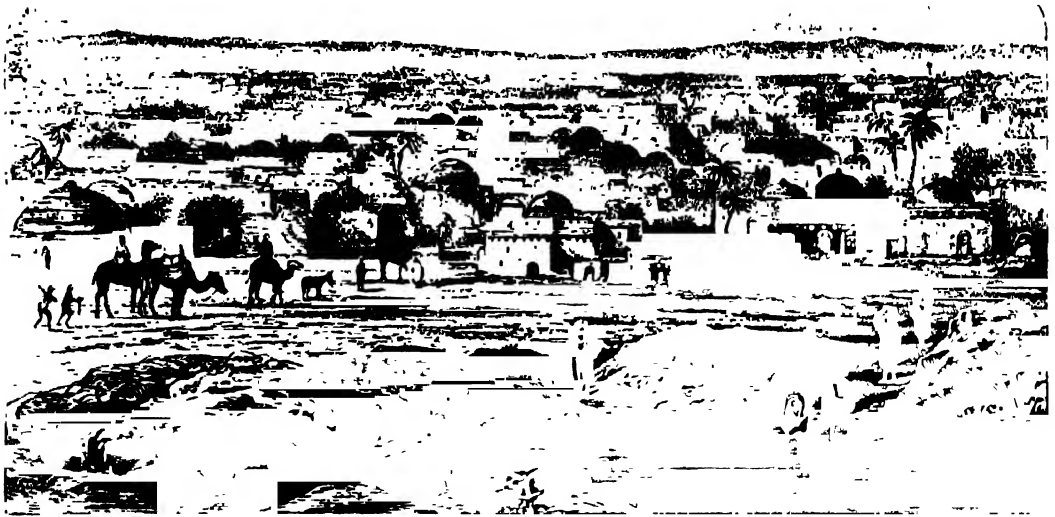
Of the chief groups of African peoples, the *Hamitic* family, emigrants from south-western Asia in remote antiquity, formerly occupied the whole of the lower and middle Nile valley, and the north-eastern maritime region of Africa nearly as far as the equator, and were the Egyptians and Numidians of history. The *Semitic* peoples, probably of the same family, who followed them from Asia within historical times, have spread over the northern and eastern region of the continent, carrying Mohammedanism with them on their way; and, as Arab ivory and slave traders, are even to this day extending their journeys into the heart of the continent. Members of the *Aryan* family have settled as yet in considerable numbers only in the northern and southern extremities of the continent (Algeria and Cape Colony), and are found elsewhere only at the trading ports around the coasts. The most widely extended race in Africa is the *Negro*, which early writers denominated the Ethiopian. In their woolly hair, black skin, the profile of the face and forehead, the oblique insertion of the incisive teeth, the form of the pelvis and the legs, we see the undoubted characteristics of a race peculiar to the African continent. In diverse tribes they occupy the whole of the central portion of the continent in enormous numbers, from the Atlantic, about Cape Verd, to Khartoum on the Nile, and southwards to the Congo. Many of them are characterized by an extravagant fondness for ornament; they live but for the moment, and are careless and improvident, passing quickly from one mood to another—from the most exuberant joy to melancholy or anger. All this has been considered to indicate an inferiority of race, fitting them only for a career of servitude. The researches of Dr. Livingstone, Speke, Grant, Stanley, and other explorers, however, have revealed to us, within the fertile Central African regions, whole nations of "blacks" who in physical appearance differ greatly from the common type of negro, being of very finely developed stature, and of symmetrical and comely aspect. There are powerful native kingdoms, in which respect for law and social order is well maintained, and the people are industrious as agriculturists, cloth-weavers, and traders in ivory, ostrich feathers, grain, &c. in busy market towns—such as Kane, in the important negro empire of Sokoto. Slavery is a "domestic institution," and while it prevails extensively amongst negro communities themselves, it will be extremely difficult to put down the horrible slave-hunting expeditions which are still the curse of the country, and which, indeed, appear by no means to have diminished since Livingstone exposed their iniquity. Year by year the Arab traders continue to increase in number, and to extend themselves further into the interior. Ivory is becoming more difficult to obtain, but slaves are becoming more numerous and easily obtainable the further westward they travel. Every Arab trader owns as many slaves as he can possibly get; and his slaves, in their desire to imitate their masters in the exercise of authority, also possess slaves. Instances are not uncommon in which these Arabs' slaves' slaves have also had a slave in the person of some little boy or girl.

who performed such offices as bringing the man water to drink, buying his food, or fetching water from the well—so thoroughly has the slave system become ingrained into the social life of the natives of Central Africa. There is a most terrible side to the "institution" in the fact that Arab slave-hunters and dealers are about as inhuman a race as can well be conceived, and in the further fact that the unhappy blacks have not even the protection of being considered valuable. They are plentiful and cheap, and the truly fiendish cruelty of their captors is therefore unrestrained by any consideration for the life of their "property."

The family which ethnologists call *Bantu*, familiar to us as the Kaffre, cover a considerable portion of South Africa, and speak a language which differs essentially from any negro tongue. They have some analogy with Europeans in their features; but they are woolly-haired, and while some are almost black, others are comparatively fair. They are a strong, muscular, active people, addicted, where uncontrolled, to plunder and warfare, but well capable of settling down to peaceful and industrial habits.

This is amply shown by the Kaffro population, numbering about half a million, of our South African colonies. All Kaffres are pastoral, keeping large herds of cattle; and many of the tribes inhabit large towns and well-built houses, cultivate the ground carefully, and exhibit every appearance of civilization. The word Kaffre (or Kafir, as it ought to be written) is Arabic, and was first applied to the inhabitants of the coast of Mozambique by the Mohammedans, in whose eyes they were *kafirs*—that is, infidels.

Another native African race, and one possessing a language which is radically distinct from any other known form of speech, is the *Hottentot*. They were at one time spread over the territory now called Cape Colony, but are now, in much diminished numbers, compressed into the south-western portion of the Cape, about the basin of the Orange River. They have often been regarded as the most indolent, helpless, and dirty of the human family, while their appearance was supposed to be revolting to civilized ideas. A singular race they certainly are, and where they originally came from, and how they happen to be confined entirely to this remote corner of the earth, is a puzzle to



Kana.

ethnologists. They have the flat nose of the negro, but more resemble the Chinese or Malays, or their original stock the Mongols. Like them, they have the broad forehead, the high cheek-bones, the oblique eye, the thin beard, and the dull yellow tint of complexion, resembling the colour of a dried tobacco leaf; but there is a difference with regard to the hair, which grows in small tufts, harsh, and rather wiry, covering the scalp somewhat as the hard pellets of a shoebrush. Their unfavourable condition was doubtless due to some extent to the barbarous treatment they from the first received at European hands. Under British sway they have shown no small degree of intelligence, and have proved themselves well worthy of humane treatment. They possess property, build some very good villages, and some of the neatest and best cultivated gardens in South Africa belong to communities of *Hottentots*.

Lowest of all in African humanity are the wandering *Bushmen* of the Kalahari deserts, living in holes and caves like wild animals, without dwelling or property, or any domestic animal, save, it may be, a miserable dog.

Religion.—The *Coptic*, a small remnant of the ancient Egyptians, ascribe their conversion to the apostle Mark,

and are Christians. Their highest dignity is a patriarch of Alexandria, and they are exceedingly strict in their religious observances. The Abyssinians are also nominally Coptic Christians, and their *abuna* (father or patriarch) is consecrated at Alexandria; but their whole religion consists in the performance of empty and unintelligible ceremonies. Throughout the rest of Northern Africa, and along the eastern coast, the Arabs have spread Mohammedanism far and wide, so that perhaps a quarter of all the inhabitants of the continent have received this religion. Even at Lagos, on the West African coast, there may be seen followers of Mohammed, who, having made the long pilgrimage across the continent and the Red Sea to Mecca, have become entitled to the green turbans they wear.

At the present day the remarkable negro people called *Fulatah*, or *Fulah*, converted to Mohammedanism in the middle of the eighteenth century, have spread their faith in Central Africa by force, as the first followers of the Prophet were wont to do, by carrying on religious wars with the surrounding pagans. They have formed great empires in the Western Soudan, some of which are increasing in extent and power.

The mass of the people in South and Central Africa can

scarcely be said to have any religion. They do not adore the sun or any other object or idol, but their belief is in malign spirits, and in charms or "fetishes," which are mainly of use to counteract their evil designs.

Many Jews have settled in Egypt, Abyssinia, Algiers, and Morocco.

All the various known countries of Africa will be found described under their respective names; and in those articles will, of course, be given many details which cannot properly be included within this general description of the continent.

AFRICAN ASSOCIATION, a society formed in London in the year 1788 for the encouragement of African exploration, and the introduction of civilization among the natives. It employed several travellers, whose zeal and ability resulted in the acquisition of a great deal of information connected with the geography of Africa. Among them may be mentioned the names of Mungo Park, who sailed under the auspices of the society in 1795, and John Lewis Burckhardt, who started in 1809. It ceased to exist as a separate society in 1831, when its remaining members were incorporated with the Royal Geographical Society.

AFT, a term used by seamen to denote the stern of the ship, or parts near the stern. It is the opposite of *fore*. *Afore and aft* means the whole ship; *right aft* is in the direct line of the stern.

AFTER-MATH is the grass which grows after the hay has been made; it is also called *latter-math*, *rowen*, or *rowett*, and when left long on the ground it is called *fogg* in some places. Where the land is rich and hay valuable, the after-math is often mown and made into hay.

AGA, the name of a dignity, and also an epithet of respect, among the Turks. It signifies, literally, a great man, a lord, or a commander.

AGADES, capital of the kingdom of **ATK** or **ASHEN**, in Central Africa, is situated on the edge of an elevated table-land, about 2500 feet above the sea. It was once a place of great importance, and was probably founded by the Berbers. Before the decline of the gold trade of Gogo it had a population of 50,000, but a large part of the town is now deserted and in ruins, and the inhabitants do not exceed 7000. The houses are of clay, and the only structure of importance is the chief mosque, with a tower 95 feet high. The tongue spoken is a Songhay dialect. Agades is important as lying on the route from the countries on the N.E. to Sokoto, Kano, and other large towns. It is traversed by the salt caravans, and by pilgrims on their way to Mecca. Its principal trade is in grain. Dr. Barth suggested that this place would, on account of its good position and salubrious climate, be very suitable for the residence of a European agent.

AGALLOCHEUM. See **AQUILARIA**.

AGAMA is a genus of LIZARDS belonging to the sub-order Strobilosauria. The head is triangular; the tongue is spongy, short, and notched in front; the nostrils are at a little distance from the point of the muzzle, on each side. There are from two to five incisor teeth in the upper jaw. There is a longitudinal fold in the skin under the throat, and another often double across the neck. The body is thick and covered with strongly-keeled scales, some of which form groups of spines upon the regions of the nape of the neck and ears. The skin is loose, and can be inflated at the will of the animal. The tail is elongate and tapering. Most of the species are natives of South Africa and Egypt, a few being also inhabitants of the East. They tenant ruins, heaps of stones, and rocks, concealing themselves in the chinks and fissures, and their dull and sombre hues tend in such places to their security. *Agama variabilis* rivals the chameleon in its changes of colour. Geoffroy St. Hilaire, in his description of the reptiles of Egypt, says that it is "often of a beautiful

deep blue, tinted with violet, with the tail barred with black, and with some indistinct reddish spots disposed upon the back in such a manner as to form four or five small rather regular transverse bands. In a few more seconds the blue is replaced by clear lilac; then the head and feet are ordinarily tinted with green, and there is nothing left to recall the remembrance of the first colours except the small red spots of the back." The spiny agama (*Agama aculeata*) is a native of the Cape of Good Hope.

AGAMEMNON, king of Mycenæ, and sovereign of all Argos, that is, of Peloponnesus, commander-in-chief of the Grecian army at the siege of Troy. Passing over the fabulous genealogies of the poets, we may trace Agamemnon through those relations which appear to bear some mark of historical truth. He was the son of **ATREUS**, whence he and his brother were called **ATRIDÆ**, and he married **Clytemnestra**, sister of **HELEN**. The Trojan War arose out of the abduction of Helen by Paris, son of Priam, king of Troy. A number of the princes of Greece having been drawn together as suitors by the extraordinary beauty of Helen, her father, Tyndareus, had exacted an oath from them, that on whomsoever the choice should fall, if the maid should be carried off, all the rest should unite to recover her; and in virtue of this oath the confederate princes assembled under the command of Agamemnon to restore Helen to her husband Menelaus.

The assembled fleet was detained at Aulis, in Boeotia, by contrary winds. The seer Calchas, being consulted how the anger of the gods might be averted and the delay obviated, declared that Agamemnon had incurred the displeasure of Artemis by killing her favourite sacred stag, and that Iphigenia, his daughter, must be sacrificed to the goddess. The natural reluctance of the father was overcome by importunity and ambition; and the intended victim was summoned to Aulis, under pretence of betrothing her to Achilles. At the point of death she was miraculously saved by Artemis, who substituted a stag for her, carried her off, and made her her priestess among a savage people of Asia called the Tauri. This story is related neither by Homer nor Hesiod; it rests, however, on the early authority of Pindar ("Pyth." ii.) and Æschylus, and is pregnant with too important consequences to be omitted, since the alienation of Clytemnestra from her husband is said to have originated in her horror of this unnatural action. The siege of Troy was protracted for ten years, and the most memorable event of it is the quarrel near its close between Agamemnon and Achilles, which forms the subject of the Iliad. "King of men" is the distinguishing epithet constantly added to the name of Agamemnon, as "swift-footed" is to the name of Achilles.

Returning from Troy he was treacherously murdered by his wife Clytemnestra, who, during his absence, had formed an adulterous attachment to his cousin, Ægisthus, son of Thyestes. This catastrophe is the subject of the "Agamemnon" of Æschylus, one of the most sublime compositions in the range of the Grecian drama. Orestes, son of Agamemnon, then a child, was saved by the care of his tutor and timely flight. After passing seven years in exile he returned in secret, avenged his father's death by the slaughter of his mother and of Ægisthus, and recovered his paternal kingdom, which he ruled with honour. These legends of the house of Agamemnon formed a favourite subject with the Greek tragedians.

AGAMI (*Psophia crepitans*), a large and very beautiful bird, often called the Gold-breasted Trumpeter, a native of tropical America. Though not strictly speaking a wading bird, it is classed in the order **GALLINÆ**. It is an anomalous form intermediate between the cranes and the bustards, and may be considered as the American representative of the latter, which are confined to the Old World.

The agami is an inhabitant of the upland forests and mountains of the warmer parts of South America, where it lives on fruits and seeds. It is gregarious, associating in large flocks, and walks and runs with great swiftness, seldom taking wing except when hard pressed, and then only skimming a few feet above the surface of the ground. These birds utter a peculiar hoarse cooing or trumpet-like sound, preceded by a wild cry, without opening the bill. This noise is produced by a peculiar construction of the trachea, to which certain air-sacs are attached, and which are influenced by muscular pressure.

The agami makes no nest, but scratches a shallow place at the foot of a tree, where it deposits its eggs, from ten to sixteen in number, and of a light green



The Agami (*Psophia crepitans*).

colour. They are somewhat larger than those of a hen, and of a rounder form. It is a common custom in Guiana to domesticate the agami and keep it in poultry yards, from the notion that it protects the fowls from the attacks of predacious birds. It becomes very docile and familiar, and displays great attachment to those who feed and notice it, but is jealous of all rivals.

In the size of the body the agami equals a large fowl, but in consequence of the length of its neck and legs stands very much higher. The beak is short; the head, except a naked circle round the eyes, and the whole of the neck, are covered with black velvety feathers; on the breast they become large and rounded, their edges being of a glossy metallic purple and green. The back is covered with long silky plumes of a delicate grey, which hang gracefully over the wings; these are black, as are also the tail and under surface. The feathers of the tail are soft and short; those of the under parts loose and hairy; bill, black; legs, olive green.

AGAPÆ (Greek), a term signifying those meetings of the early Christians, which have been also called love-feasts. In verse 12 of the Epistle of Jude, where we read, "these are spots in your feasts of charity," the Greek word is *ἀγᾶται*. It would appear that as early as the days of the apostles these meetings were occasionally perverted from the purpose of their institution; but love-feasts continued to be generally celebrated till about the middle of the fourth century. In modern times the love-feast has been revived in a modified form by the Moravians, the Methodists, and, in Scotland, by the Glassites.

AGARICUS is a genus of the Fungus class, and

comprehends such as have a cap (*pileus*) of a fleshy nature, furnished on the under side with a number of vertical plates or gills which are membranaceous, and easily splitting into two. The gills bear the spores, the microscopic, dust-like, reproductive bodies. This genus consists of not fewer than a thousand species, inhabiting meadows, heaths, rocks, and masses of decaying vegetable matter, in all Europe, and in many other parts of the temperate regions of the earth. Among them a large proportion are poisonous, a few are wholesome, but by far the greater are altogether unknown in regard to their action upon the human constitution. The species are often extremely similar; there is no means of distinguishing botanically the tribes that are poisonous from such as are wholesome, but in every case practice is requisite to determine that point independently of general structure. It is for this reason that the use of wild mushrooms is so dangerous, and that a French botanist of no little celebrity would never suffer any to be brought to his table that had not been raised by art in a garden. Indeed there is this most remarkable fact connected with their qualities—a fact which seems to show that their properties depend upon climate and situation and accidental circumstances, rather



Eatable Agarici.



Poisonous Agarici.

than upon any specific peculiarities—that those kinds which are wholesome in one country are not so in another; thus, in Great Britain the common mushroom (*Agaricus campestris*, fig. 1), the fairy-ring agaric (*Agaricus pratensis*, fig. 2), and the *Agaricus Georgii* are quite safe to eat; while the *Agaricus virosus* (fig. 3) and the fly agaric (*Agaricus muscarius*, fig. 4) are extremely poisonous. But in other countries of Europe it is different. In France, in Italy, and especially in Russia, a usual aliment is afforded by a great variety of species, which, although very common in this country, it would be dangerous to eat; and, on the other hand, even the dangerous *Agaricus muscarius* is used for its intoxicating properties in Siberia.

Of the thousand species thus much is certain, that all having the following characters are poisonous:—1. Such as have a cap very thin in proportion to the gills. 2. Such as have the stalk growing from one side of the cap. 3. Those in which the gills are all of equal length. 4. Such as have a milky juice. 5. Such as deliquesce, that is, run

speedily into a dark watery liquid. 6. And lastly, every one that has the collar that surrounds the stalk filamentous, or resembling a spider's web. Amongst the rest may be noticed the following eatable kinds:—*Agaricus campestris*, the common mushroom (fig. 1), the species that is so commonly raised artificially for food. This is readily known in any state by its fragrant odour, by which alone it may be always recognized, and the absence of which is extremely suspicious. When in a very young state, it resembles little snow-white balls, which are called *buttons*; afterwards it acquires a stalk, separates its cap, and becomes shortly conical, with liver-coloured gills, and a white, thick, fleshy cap, marked with a few particles of gray. At a more advanced age the cap is concave, the colour gray, and the gills black; in this state it is called a *slap*. For the method of cultivating it, and for its physiological characters, see MUSHROOM. *Agaricus Gambosus* is like the latter, but its gills are always very pale, and its flavour inferior. *Agaricus procerus* has a cap with a knob at the top, and the buff-coloured skin is torn up into scales; the stem is tall, hollow, with scales, and bulbous at the base. It is of large size, often several inches across.

AGA'SIAS, an Ephesian sculptor of the time of Alexander the Great, to whose chisel we owe the fine antique known as the "Fighting Gladiator," an outline of which will be found amongst our Plates on SCULPTURE. The figure is evidently fighting an enemy above him, probably on horseback. It was found at Antium with the Apollo Belvedere, and is now in the Louvre at Paris.

AGASSIZ, LOUIS JOHN RUDOLPH, was born at Orbe, Canton de Vaud, 28th May, 1807. His father was Protestant pastor of St. Imier, Basel; his mother, Madame Rose Mayor, was the daughter of a physician in the Canton de Vaud. After the usual elementary studies, Agassiz went to Zurich to study medicine in 1824. Thence he passed to Heidelberg for one session, and then, in the autumn of 1827, removed to the University of Munich, where Oken the zoologist, Martins the botanist, Schelling the philosopher, and Döllinger the physiologist were attracting crowds to their lectures. With these men Agassiz soon became intimate, and under their instructions he laid the foundations of those great acquirements which have made him famous in natural history and in the literature of the natural sciences. Spix, the zoologist, having died shortly after his return from Brazil, and before he had completed the ichthyological part of the great work undertaken by Martins, Pohl, and himself, Agassiz was chosen to finish it. This work made him well known. Having taken the degrees of Ph.D. and M.D., he devoted himself to researches on the natural history of the fresh-water fishes of Europe. While gathering materials his attention was drawn to fossil fishes, in connection with which he began that great work, "*Recherches sur les Poissons Fossiles*," which first made him famous in Britain and America. He next passed to another branch of natural history—the study of the glacial system of his native mountains, and his "*Études sur les Glaciers*," published in 1840, opened up a subject of philosophical inquiry to which little attention had been devoted up to that time. Since 1838 he had held the professorship of natural history at Neuchâtel, and about 1847 he was invited to Boston, United States, to occupy a similar chair in the University of Cambridge. While busily engaged in his professional duties he found time to write several scientific works, including the *magnum opus* of his life, "Contributions to the Natural History of the United States." He also laid the foundation of the great work "*Bibliographia Zoologie et Geologie*," published in four volumes, in the series of works issued by the Ray Society.

Agassiz died at New York in December, 1873, in the sixty-seventh year of his age, and in him the world lost a philosopher and naturalist whose name will be remembered

with those of Buffon, Cuvier, and Humboldt, and of whom both his native Switzerland and his adopted America have good reason to be proud.

AG'ATE, sometimes called *Scotch Pebble*, is an ornamental stone used in jewelry. It is one of the many forms under which silica presents itself, almost in a state of purity; constituting in the agate from 70 to 96 per cent. of the mineral. It presents a semitranslucent mass with a sort of resinous fracture; and is sometimes tinted by a minute quantity of iron. The variations both of translucency and of tint in the same stone are often so great as to give much richness of appearance; and this, combined with the high polish which they are capable of receiving, imparts great value to some specimens of agate. These stones generally occur in the form of detached rounded nodules, in a variety of the trap rocks called Amygdaloid. It is found in large quantities in Scotland and Germany, and is also imported from Brazil and India. The principal varieties are chalcedony, cornelian, bloodstone, and chrysoprase. It is largely used for ornamental purposes, and in the process of manufacture the natural colours of the stones are heightened or altered by artificial means. Frequently beautiful markings, like drawings of moss, trees, or small landscapes, occur in agates.



Moss Agate.

AGATHARCHIDES, a Greek writer on geography, a native of Chidos in Asia Minor, who flourished about B.C. 150. He is the earliest extant writer who attributes the annual rise of the Nile to the periodical rains in the upper regions of that river (Ptolemy, i. 41). He has left a very minute account of the mode of working the gold mines between the Nile and the Red Sea; and he is the first extant writer who has mentioned the giraffe, or camelopard (Camelopardalis). He describes the mode of hunting elephants, and the inhabitants of the west coast of the Red Sea.

The remains of Agatharchides (only preserved to us in quotations) are collected in Hudson's "Minor Greek Geographers," vol. i. The description of the gold mines is in Diodorus, iii. 12.

AGATHARCHUS, a Greek painter, who apparently, from a passage in Vitruvius, may be considered, if not the inventor, at least the first artist who applied the laws of perspective practically in painting. He painted a dramatic scene for Æschylus in perspective, which was the first work of the kind exhibited to the Greeks. As the contemporary of Æschylus, therefore, he was a man of mature years about 480 B.C.

There was another Greek painter of the name of Agatharchus, who lived about half a century later.

AGATH'IAS, a Greek historian and poet, who lived under the emperors Justinian and Justinus the Younger. He was born at Myrina, in Asia Minor, about A.D. 536, but he received his education at Alexandria, whence he went in 554 to Constantinople. He died about 588, in the reign of Mauritius Thrac. He is the authority as to the epoch of Narses, Belisarius, &c., and therefore of great value.

AG'ATHIS is the generic name given by botanists to the trees known in common language by the name of Dammar Pine and Kawrie Pine. These plants belong to the order CONIFERÆ, from all other species of which they are known, first, by their broad, lance-shaped, leathery leaves, the veins in which are numerous and nearly parallel, diverging a little at the base, and converging at the apex; and, secondly, by their seeds having a wing on one or both sides instead of proceeding from the end. They are natives of the Malayan Archipelago, the islands of the Pacific Ocean, New Caledonia, Australia, and New Zealand.

AGATHOCLES, a Syracusan potter, who became ruler of Syracuse and great part of Sicily. He married the widow of his patron, and with the large fortune thus gained achieved a position. More than once exiled, he yet at last succeeded in becoming autocrat of all Sicily except the colonies of Carthage. Carthage, alarmed at his greatness, sent Hannibal against him, who defeated him at Himera in B.C. 310; whereupon Agathocles, with a daring almost beyond belief, left Hannibal to besiege the almost impregnable Syracuse, and carried the war into Africa against Carthage itself, with the most brilliant success. He made a favourable treaty with Carthage in 307, and thenceforward reigned securely, with occasional raids into Italy, &c., till 289, when he died at the age of seventy-two, after ruling Sicily twenty-eight years. Some authors consider he was poisoned.

AGAVE, in botany, comprehends those plants which gardeners call American aloes. They belong to the order AMARYLLIDACEÆ.

There are many species of this genus, one only of which requires to be mentioned.

Agave americana, or the American aloe, is a plant which, when full grown, has a short cylindrical woody



Agave Americana.

stem, which is terminated by hard, fleshy, spiny, sharp-pointed, bluish-green leaves, about 6 feet long, and altogether resembling those of the arborescent aloes. It is commonly supposed that this plant only reaches maturity at the end of 100 years; but this, like many other popular opinions, is an error, the period at which the agave arrives at maturity varying, according to circumstances, from ten to fifty or even seventy years. In hot or otherwise favourable climates it grows rapidly, and soon arrives at the term of its existence; but in colder regions, or under the care of the gardener, where it is frequently impracticable to attend to all the circumstances that accelerate its development, it requires the longest period that has been assigned to it. Having acquired its full growth it finally produces its gigantic flower-stem, after which it perishes. This stem is sometimes as much as 40 feet high, and is surrounded with a multitude of branches arranged in a pyramidal form, with perfect symmetry, and having on their points clusters of greenish-yellow flowers, which continue to be produced for two or three months in succession. The native country of the American aloe is the whole of America within the tropics, from the plains

nearly on a level with the sea to stations upon the mountains at an elevation of between 9000 and 10,000 feet.

In Humboldt's "Views of Nature," he says, "The self-sustaining form of the bluish-flowered aloe tribe presents a marked contrast to the pliant climbing lianes, with their fresh and brilliant verdure. When there is a stem it is almost branchless, closely marked with spiral rings, and surrounded by a crown of succulent, fleshy, long-pointed leaves, which radiate from a centre. The lofty-stemmed aloe does not grow in clusters like other social plants, but stands isolated in the midst of dreary solitudes, imparting to the tropical landscape a peculiar, melancholy character."

The sap is made to flow by incisions in the stem, and furnishes a fermented liquor, called by the Mexicans *pulque*; from this an agreeable ardent spirit, called *vinu mercial*, is distilled. The fibres of the leaves form a coarse kind of thread; the flowering stems dried make an almost imperishable thatch; an extract of the leaves is made into balls, which will make a lather with water; the fresh leaves themselves, cut into slices, are occasionally given to cattle; and, finally, the centre of the flowering stem split longitudinally is by no means a bad substitute for a European razor strop, owing to minute particles of silica forming one of its constituents.

AGE (Physiology). The term of human existence is divisible into distinct periods, each of which is distinguished by characters peculiar to itself. These characters, as far as they are external, are obvious to every one; but these external characters depend on internal states which are not obvious, and which have been discovered only by careful and persevering research. And the curious and interesting facts which those researches have disclosed, show that the different epochs into which life is divided are not arbitrary distinctions, but arise naturally out of constitutional differences in the system, dependent on different physiological conditions. The natural epochs of human life are six, namely, the periods of infancy, childhood, boyhood or girlhood, adolescence, manhood or womanhood, and old age. The space of time included in the first four of these periods is fixed. In all persons, after the lapse of a certain number of years, a definite change in the system uniformly takes place, in consequence of which the peculiarities which distinguish one period give place to those which characterize the succeeding. Thus the period of infancy, commencing at birth, extends to the end of the second year, the point of time at which the first dentition is completed; the period of childhood, commencing at the close of the second year, extends to the termination of the seventh or eighth year, the point of time at which the second dentition is completed; the period of boyhood or girlhood extends from the seventh or eighth year to the commencement of the age of puberty—that is, in general, in this country, in the female from the twelfth to the fourteenth year, and for the male from the fourteenth to the sixteenth year; the period of adolescence extends from the commencement of the period of puberty to the twentieth year of the female and the twenty-fourth of the male; the period of womanhood extends from the twentieth year, and of manhood from the twenty-fourth year, to an age neither determined nor determinable with any degree of exactness, because the point of time at which mature age lapses into old age differs in every individual. It differs in many cases by a considerable number of years; and it differs according to primitive constitution, to the management of early infancy and childhood; according to regimen, exercise, occupation physical and mental, and the several other circumstances included under the general term "mode of life."

The changes which take place in the system at the different epochs of life consist of changes in the physical condition of the body, which it will be useful briefly to trace. These changes are intimately connected with and

are mainly dependent on the operation of a principle of consolidation, the influence of which, commencing at the first moment of existence, continues, without intermission, until the last moment of life.

When first the human EMBRYO becomes distinctly visible, it is almost wholly fluid, consisting only of a soft gelatinous pulp. In this gelatinous pulp solid substances are formed, which gradually increase, and are fashioned into organs. These, in their rudimentary state, are soft and tender, but in the progress of their development constantly acquiring a greater number of solid particles, the cohesion of which progressively increases, the organs at length become dense and firm. As the soft solids augment in bulk and density, bony particles are deposited, sparingly at first and in detached masses, but accumulating by degrees; these, too, are at length fashioned into distinct osseous structures, which, extending in all directions, until they touch at every point, ultimately form the connected bony frame-work of the system. This bony fabric, like the soft solid, tender and yielding at first, becomes by degrees firm and resisting; fitted to be the mechanical support of the body, and the defence of all the vital organs.

But among all the changes induced in the body by the progress of age, none is more remarkable, or has a greater influence in diminishing the energy of the actions of the economy, and in causing the ultimate termination of all those actions in death, than the change that takes place in the minute blood-vessels. The ultimate divisions, or the smallest branches of the arteries and veins, the CAPILLARY VESSELS, as they are termed, are exceedingly abundant in the early periods of life, and are as active as they are numerous. The capillary arteries diminish both in number and activity from infancy to childhood, from childhood to youth, from youth to maturity, and from maturity to old age. Their coats, like other soft solids, increase in density and rigidity; their diameter contracts, many of them become completely impervious, and ultimately disappear. The diameter of the capillary veins, on the contrary, enlarges. The coats of the veins, originally thinner than those of the arteries, instead of thickening and contracting, seem rather to grow thinner and more dilatable; hence their fulness, their prominence, their more tortuous course, and their greater capacity. At the two extreme periods of life the quantity of blood contained in these two sets of vessels is completely inverted. In infancy the proportion of blood contained in the capillary arteries is greater than that contained in the capillary veins; in youth this disproportion is diminished; at the period of maturity the quantity in one set nearly, if not exactly, balances that in the other; in advanced age the preponderance is so great in the veins, that these vessels contain probably two-thirds of the entire mass. This difference in the distribution of the blood, at the different epochs of life, affords an explanation of several important phenomena connected with health and with disease. It shows, for example, why the body grows with so much rapidity at the early periods of life; why it remains stationary at the period of maturity; why it diminishes in bulk as age advances; why a plethoric state of the system affects the arteries in youth, the veins in age; why hæmorrhage, or a flow of blood, is apt to proceed in the young from the arteries, and in the aged from the veins; and so on.

In each of the epochs of life the health is peculiar; the diseases to which each is prone have also a specific character. A degree of energy in the vital actions, constituting a state of healthy vigour in one period, may be destructive violence in another; and a degree of intensity in the physical agent upon which those actions depend, merely sufficient to produce moderate excitement in one, may produce fatal stimulation in another.

AGE. Defect of age is in the law of all civilized

countries a ground of incapacity for doing many acts and owing certain duties. By the English Law a male of the age of twelve years may take the oath of allegiance; and at fourteen, which for many purposes is considered the age of discretion, a person of either sex may choose a guardian. As to the capacity to be a witness, children under twelve are frequently permitted to give evidence, after it has been ascertained by examination that they understand the nature of an oath. No will made by any person under the age of twenty-one years is valid. A person may be appointed executor at any age, but he cannot act till he is twenty-one.

A woman may consent to marriage at twelve, and a man at fourteen years of age; though parties under the age of twenty-one years cannot marry without the consent of their respective parents or guardians. The age of twenty-one years is, for most civil purposes, the full age both of a man and woman, at which period they may enter into possession of their real and personal estates, and make contracts and engagements. All persons under the age of twenty-one are legally called infants. A man cannot be ordained a priest till twenty-four, nor be a bishop till thirty years of age. A man cannot take his seat in the House of Lords, nor be a member of the House of Commons, before he has attained the age of twenty-one. In the Congress of the United States of America, a member of the Senate must not be under thirty; and to be eligible to a seat in the House of Representatives it is necessary to have attained the age of twenty-five.

With respect to crimes, the law of England regards the age of fourteen years as the age at which a person is competent to distinguish between right and wrong. Under the age of seven years a child is not punishable for an offence; but above that age, and under the age of fourteen years, if it clearly appears that a child is conscious of the nature of the crime which he commits, he may be tried and punished for it.

The Romans made three periods of age with reference to legal capacity—1, Infancia, or the period from birth to the completion of the seventh year; 2, from the termination of Infancia to the attainment of puberty, when persons were called Puberes; 3, from the attainment of puberty to the twenty-fifth year, during which time males were called Adolescentes or Minores. From the attainment of the twenty-fifth year they were called Majores. An infans could do no legal act. A person under the age of puberty could do the necessary legal acts in respect of his property with the sanction (*auctoritas*) of his tutor, who was the guardian of his property. It was somewhat unsettled what was the age at which a male attained puberty, but the best opinions fixed it at fourteen. A woman attained puberty at the age of twelve. Males who were puberes could manage their property, contract marriage, and make a will. Roman women of all ages were under some legal incapacities. Male persons between the age of puberty and twenty-five were protected to a certain extent in their dealings by a *Lex Prætoria*, and the rules of the *Prætorian Edict*, which were founded upon it. Under the Emperor Marcus Aurelius, all persons under twenty-five were required to have a curator, whose functions and powers were somewhat similar to those of the tutor up to the age of puberty.

(Savigny, "Von dem Schutz der Minderjährigen, Zeitschrift für die Geschichtliche Rechtswissenschaft," vol. x., and "System des Heut. Röm. Rechts," iii. 21, &c.)

AGE OF ANIMALS. Every species of organic being has a definite duration of life, a duration determined by the laws of nature, but which cannot be known except by experience. Hence it is that a table of the natural duration of life throughout the whole of the animal kingdom, or even throughout the vertebrate classes, involves a

thousand insurmountable difficulties in the way of its execution.

It is generally considered, as a rule, that the sooner an animal arrives at maturity the sooner is its existence terminated; and without doubt a certain degree of truth attaches to this opinion, more especially on a broad comparison of the vertebrate classes among each other. Tortoises and turtles drag on through a life of ages, and the same observation applies to crocodiles and huge snakes, such as boas and pythons. With respect to fishes, whose growth is slow, and whose skeleton never attains to the consistency which characterizes the bones of mammalia and birds, and which in some, as the rays, skates, sharks, &c., remains permanently cartilaginous, their existence seems to be remarkably enduring. They inhabit a medium much less liable to sudden alterations of temperature than is the atmosphere, and their muscular powers are very great. The pike has been known to live 267 years, and the carp 290, without ending their existence even then according to the course of nature. It is probable that the oceanic fishes enjoy a still longer term of life than the fresh-water species, but no sufficient data exist upon the subject. Fishes devour each other in turn, and few die a natural death, except perhaps the largest and most voracious, who have survived the general conflict, in which, while they were yet small, they took their chance.

Birds vary greatly as to their term of life. The eagle, the vulture, the raven, the swan, the parrot, the goose, and some others, live to a great age; but among the smaller birds, ten, fifteen, or, at the most, twenty years, are the extent of their existence. The caged canary will live from ten to fifteen years.

With regard to the Mammalia, it is not easy to extend general rules to anything like universal application. The most prolific are generally the shortest lived. This we see exemplified more particularly in the Rodentia, which are as a rule extremely prolific, and of which the existence, on the average, is of short duration. Yet, notwithstanding this, so rapidly do they multiply, that were their numbers not thinned by numerous predatory enemies, they would desolate the most fertile regions of the earth, and perish in a famine of their own creation. On the other hand, as might be anticipated, the larger Mammalia, and more especially those which produce a single offspring in the course of every two years, enjoy an extended duration of existence. The life of the elephant, the rhinoceros, and the hippopotamus is said to extend to more than a century; yet the horse is in extreme age at thirty, and so is the ox; the sheep will live for about fifteen years; but none of these large herbivora produce throughout the whole of their lives as many offspring as the rabbit does in one summer. The hog, unlike the Pachydermata generally, is very prolific, and yet very long-lived.

Among the Carnivora there is greater variation as regards the longevity of species. The cat and dog live from fifteen to twenty years. The lion, which is scarcely mature till five years old, may live for fifty or sixty years, and perhaps longer. The bear is said to attain to a great age, but our data are all uncertain.

To determine the exact age of animals is often a matter of importance; we mean the months or years which they have numbered at a given time. The characters of the dentition in mammalia will at once enable us to determine whether a quadruped is immature, mature, or aged; and in some cases, as the ox and the males of the red and fallow deer, the horns will assist us in our diagnosis; the increase of the rings at the base of those of the former, and that of the number of snags and branches in the antlers of the latter, being good indicia. In the females of the deer tribe these tests fail, because they have no antlers. Up to a certain age the teeth of the horse (if not unfairly

treated) will indicate its age; and in horned cattle and sheep the incisors may be studied as indicia in this respect. Yet our domestic animals, as it is among ourselves, bear their age very differently—the toil-worn labourer is aged at forty, while another man at sixty or sixty-five appears younger. We see some horses old to all intents and purposes at seven or eight, and others hale and hearty at an advanced period; their age, as Adam in "As you like it" says, "is as a lusty winter, frosty but kindly."

AGE OF TREES. Everything connected with the growth of timber trees, their duration, and the causes which conduce to their decay, bears so directly upon points not only of general interest, but of great practical importance, that we have thought it advisable to devote an article to its separate consideration.

Plants, like animals, are subject to the laws of mortality, and in many cases have the period of their existence determined by nature with as much exactness as that of an insect. But at the same time, not only their structure but their vital actions are so peculiar that little analogy can, in any case, be traced between the most perfect of them and the animal world; and a very large proportion appear to be capable of an almost indefinite period of existence, if it were not for accidents and disease, independent of old age.

It is chiefly to annual and biennial plants that what may be called a precise period of duration is fixed—a period determined by the production of their fruit, and not capable of being prolonged beyond that event except by artificial means. Dismissing all such from our consideration, the remainder of the more perfect part of the vegetable kingdom, whether herbaceous, or shrubby, or arborescent, consist of plants which may be classed under two principal modes of growth.

One of these modes is to increase, when young, in diameter rather than in length, until a certain magnitude is obtained, and then to shoot up a stem, the diameter of which is never materially altered. Such trees belong to the class of **MONOCOTYLEDONS**.

The other mode is, from the beginning, to increase simultaneously in length and diameter, but principally in length. The addition of new matter to a trunk of this kind takes place by the insinuation of longitudinal fibres into a space beneath the bark, and on the *outside* of the wood near the circumference. They belong to the class of **DICOTYLEDONS**, or to **GYMNOSEMS**.

To the Monocotyledons belong the palm tribe and some other tropical trees. There is scarcely any well-attested evidence of these plants ever acquiring any considerable age. It has indeed been supposed that certain Brazilian cocoa-nut palms may be from 600 to 700 years old, and that others probably attain to the age of something more than 300 years. But the method of computing the age of palms, which is either by the number of rings externally visible upon their rind between the base and the summit of the stem, or by comparing the oldest specimens, the age of which is unknown, with young trees of a known age, is entirely conjectural, and not founded upon sound physiological considerations; besides which the date-palm, which is best known to Europeans, does not at all justify the opinion that palms attain a great age; the Arabs do not assign it a greater longevity than from two to three centuries. But in dicotyledonous trees it is quite the reverse; to their existence no limited duration can be assigned. Many other cases of oaks of extreme old age are recorded, some of which have been estimated at 1500 or 1600 years. A rose tree growing in the crypt of the Cathedral of Hildesheim is between 800 and 900 years old.

The famous dragon tree (**DRACÆNA**) of Orotava, which was destroyed by a hurricane in 1867, was supposed to rival the Pyramids in antiquity.

De Candolle says that of all European trees the yew attains the greatest age; thirty centuries has been assigned as the age of a yew at Braburn in Kent, twenty-five or twenty-six centuries to the Scotch yew of Fortingal, and nearly fifteen to that of Crowhurst in Surrey.

At Ankerwyck House, near Staines, is a yew older than the meeting of the English barons at Runnymede, when they compelled King John to grant Magna Charta. This tree, at 3 feet from the ground, measures 9 feet 3 inches in diameter; and its branches overshadow a circle of 207



The Ankerwyck Yew.

feet in circumference. The yews at Fountains Abbey, in Yorkshire, are probably more than 1200 years old.

Even this antiquity is, however, much less than that of the baobab trees of Africa, estimated by Adanson at 5000 years, and the deciduous cypress of Chapultepec in Mexico, which De Candolle considered still older.

The way in which the age of some of these specimens has been computed is twofold: first, by comparing them with other old specimens, the rate of growth of which is known; and secondly, by cutting out a portion of their circumference and counting the number of concentric rings that are visible, for in dicotyledonous trees the woody cylinder of one year is divided from the succeeding one by a denser substance, which marks distinctly the line of separation of the two years.

The first of these methods is sufficiently correct to give at least an approximation to the truth, and the latter would be absolutely correct if one could be quite sure that observers provided against all possible causes of error. But it has been shown by Lindley that in consequence of the extreme inequality in thickness of the annual layers of wood on opposite sides of a stem, a person who judged of the whole age of a tree by the examination of the layers of the stunted side only, would commit errors to the amount of 60 per cent. and more. It is by no means impossible that the great age assigned to the deciduous cypress and the baobab may be connected with an error of this nature.

AGEN. See LOT ET GARONNE.

AGENT (from the French *agent*, and that from the Latin *agens*). An agent is a person authorized by another to do acts for him and in his name; and the person who authorizes him is called the principal.

An agent cannot be appointed to bind his principal otherwise than by deed; nor can an agent be appointed by a corporation aggregate (unless for certain ordinary and inferior purposes) otherwise than by deed; and for the purpose of making leases and other acts specified in the first, second, and third sections of the Statute of Frauds, the authority of the agent must be in writing. In all other cases no particular form is necessary—a verbal appointment is sufficient; and the mere fact of one person's being

employed to do any business for another creates between the parties the relation of principal and agent.

An agent's authority (unless it is an authority joined with an interest, such as a power of attorney granted as a security for a debt) may, in general, be revoked by the principal at any time. It also ceases upon his death or bankruptcy. And if an agent agrees to act for a firm in partnership for a term of years, the contract is dissolved by the death of one of the partners during the term.

There are many kinds of agents, such as bailiffs, factors, brokers, &c. This article contains the general principles of law which are applicable to all.

The general rule is, that a man may make any contract by an agent which he can make himself, and do any act with respect to his own property by an agent which he may do himself. Any person may be an agent who would be competent to do the act for himself.

When an agent's authority is limited he is termed a *particular agent*, and he must adhere strictly to his instructions. If directed to sell he must not barter, nor if he is instructed to sell at a certain price he is authorized to take less. If a particular agent exceeds his authority, his principal is not bound.

When an agent's authority is not precisely determined, and when he is authorized to transact all his principal's business of a particular kind, at a certain place, he is termed a *general agent*; and if he exceed his authority his principal is bound, provided the excess be within the ordinary scope of his agency. There may be various grounds for supposing that a general agent has the authority he appears or affects to have, but they must be such as would lead prudent persons generally to suppose the agent had authority. In the case of a general agency, the agent is required to act for his principal like a prudent man in the management of his own business; and in undertaking the agency he impliedly promises to execute his commissions with care, skill, diligence, and discretion, and to obey the orders and directions of his principal. He ought not to accept or retain any agency unless competent to its performance.

If he is authorized to sell, and no price is limited by his instructions, he must endeavour to obtain the best price for the goods. If there have been other transactions of the same nature between the parties, it is presumed that the principal intends that the same mode of dealing should be pursued, which in former cases he had prescribed or approved.

In mercantile transactions, when the agent has no particular instructions, he should follow the common usage of the business in which he is employed; and he will be justified in doing so, even though, under the particular circumstances, he might have acted otherwise to the advantage of his principal.

The general authority to act as agent includes all necessary or usual means of executing it. An agent is therefore authorized to do all such subordinate acts as are either requisite by law, in order to the due performance of the principal object of the instructions, or are necessary to effect it in the best and most convenient manner, or are usually incidental to it in the ordinary course of business.

If an agent does an act which is not warranted by his authority, either express or implied, or if he does an act within his authority, but with such gross negligence or unskillfulness that no benefit can accrue from it, the principal may reject what he has done, if he rejects it as soon as he is informed, and gives notice to his agent within a reasonable time. If an agent puts out his employer's money at interest without his authority, or if a factor, employed to purchase, deviates from his instructions in price, quality, or kind, the principal may disavow the transaction.

If the principal does not either expressly or impliedly adopt the agent's act, the hazard of it lies with the agent, even though he did it in good faith, and for the interest of his employer. Any profit that may accrue from it he must account for to his principal; and if loss ensues he is bound to make it good to him. An agent is likewise answerable to his principal for all damage occasioned by his negligence or unskilfulness. His responsibility extends to the whole amount of the damage suffered by the principal, either by damage done to his own property, or by his being obliged to make reparation to others.

An agent must keep a regular account of his dealings on behalf of his principal, communicate the results from time to time, and account honestly when called upon.

An agent is not in general accountable for money until he has actually received it, unless he has by improper credit, or by other misconduct, occasioned a delay of payment. But an agent acting under a commission *del credere*, that is, one who has undertaken to be surety to his principal for the solvency of the persons whom he deals with, is in their default accountable for the debt. If an agent has received money on behalf of his principal, he is bound to take care of it; and if any loss is occasioned by the fraud or failure of third persons, he will, unless his conduct be warranted by his instructions or the usage of trade, be bound to make it good.

The agent must account for any interest which has been made upon the balance in his hands; and it is an inflexible rule in equity that no agent can be allowed to make any profit in the matter of his agency without the knowledge and consent of his principal.

It is the duty of an agent to apprise his principal, with all convenient expedition, of all material acts done or contracts concluded by him.

We now consider what are the duties of the principal to his agent; or what are the rights of an agent against his principal.

An agent is entitled to his commission; that is, a remuneration in return for his services. The amount of commission is sometimes determined by agreement; sometimes it is regulated by the usage of trade; and in some few cases, as of brokerage for the procuring of loans, &c., it is limited by act of parliament.

An agent may forfeit his right to commission by misconduct; as, if he keeps no account, if he makes himself an adverse party to his principal, or if, in consequence of his negligence or unskilfulness, no benefit accrues to the principal from the services performed.

An agent is also entitled to be reimbursed all such advances made on behalf of his principal as are justified by his authority, whether expressed or implied, or subsequently sanctioned by his principal. And cases may sometimes occur of urgent danger, when there are no means of referring for instructions, in which an agent is justified in making advances without particular directions. If, on account of the lateness of the season, or other good cause, he insures the cargo without orders, he is entitled to charge his principal with the premium, and in such a case the assent of the principal would be inferred from very slight circumstances.

An agent has a lien upon the property of his principal; that is, a right to retain possession of it till his demand is satisfied. Lien is either particular or general. A particular lien is a right to retain the thing itself in respect of which the claim arises. This right is possessed by bailees in general, and consequently by all agents in the nature of bailees.

General lien is a right to retain any property of the principal which may come into the agent's possession in the regular course of business. This, being an extension of the general right, exists where it is created by contract, by

the previous dealings of the parties, or by the usage of trade. Factors, packers, wharfingers, are in the nature of factors, insurance brokers, and bankers, have by usage a general lien in their respective employments.

This right may in general be exercised in respect of any claim to commission or reimbursement which the agent may have acquired in the due execution of his authority, but it does not extend to demands arising from transactions not within his course of dealing as such agent.

There can be no lien unless the agent gets possession of the goods. A consignee, for instance, can have no lien on goods consigned to him, if the consignor stops them before they come into his hands; nor has he a lien on property which has been casually left in his office, which has been deposited with him as a pledge for a specific sum, or which he has obtained possession of by fraud. If an agent parts with the possession of the property, the lien is in general lost; but if a factor pledges the goods or commercial documents of his principal as a security for advances made, with notice that they are not his own; or if, without such notice, he pledges them for a pre-existing debt due from himself, the lien of the factor on such goods or documents is transferred to the person with whom they are pledged; that is, he acquires the same right which the factor, while the goods remained in his possession, could have maintained against the principal.

The right of lien may be destroyed by the agreement of the parties; and if the agent enters into a contract with his employer inconsistent with the right (as if he agrees for a particular mode of payment), he is considered to waive it.

The responsibility of a gratuitous agent (the *mandatarius* of the Roman law) is much less than that of one who is paid for his services. He will in general incur no liability, provided he acts with good faith, and exercises the same care in the business of his employer as he would in his own. He has, of course, no right to commission, but he is entitled to be reimbursed for any reasonable payments made or charges incurred in behalf of his employer. (As to the Roman *mandatarius*, see Gaius, iii. 155-162; iv. 83, 84; "Dig." 17. tit. 1.)

We shall now explain the consequences of the relation of principal and agent, as between the parties and third persons; first, as between the principal and third persons; and, secondly, as between the agent and third persons.

It is a general rule that the act of the agent is to be considered as the act of the principal.

The agreement made by an agent, and all his dealings in connection with it, provided they are within his real or apparent authority, are binding on the principal. The representations made by an agent at the time of entering into an agreement (if they constitute a part of such agreement, or are in any way the foundation of or inducement to it), and in many cases even the admissions of an agent as to anything directly within the course of his employment, will have the same effect as if such representations or admissions had been made by the principal himself. If notice of any fact is given, or if goods are delivered to an agent, it will be considered as notice or delivery to the principal. And in general, payment to an agent has the same effect as if it had been made to the principal, and in such cases the receipt of the agent is the receipt of the principal. But such payment must be warranted by the apparent authority of his agent. If money is due on a written security, as long as the security remains in the hands of an agent it is to be presumed that he is authorized to receive the money, and payment to him will therefore discharge the debt; but if the agent has not the security in his possession, the debtor will be liable, in case the agent should not account for it to his principal, to pay it over again.

If the principal gives notice to the buyer not to pay the money to the factor with whom he made the bargain, he will in general not be justified in doing so; but if the factor had a lien upon the goods for his general balance, he has a right to require the buyer to pay him instead of his principal; and such payment to the factor, notwithstanding any notice given by the principal, will be a discharge of the debt.

A principal is in general liable for all damage occasioned to third persons by the negligence or unskilfulness of his agent, when he acts within the scope of his employment; and for any misconduct or fraud committed by him, if it be either at his express command or within the limits of his implied authority.

From this liability, however, persons are exempted who, though they appear in some degree in the character of principals, yet have no power in the appointment of those who act under them. Thus the postmasters-general, and persons at the head of other public offices, have been held not to be liable for the conduct of their inferior officers. The owners and masters of vessels are also by statute released from liability to third persons from the negligence or unskilfulness of the pilots by whom the vessels are navigated into port.

It remains to state what are the effects of the relation of principal and agent, as between the agent and third persons.

An agent is not in general personally responsible on any contract entered into by him on behalf of his principal; but there are several exceptions to this rule.

If an agent has so far exceeded his authority that his principal is not bound by his act, the agent is liable.

An agent is also liable when the contract was made with him not as agent. If in any contract made on behalf of his principal the agent binds himself, or if the circumstances of the transaction are such that the credit was originally given to him and not to the principal (whether such principal were known at the time or not), the agent will be liable, in the first instance, to the persons with whom he has dealt.

When an agent acts in his own name, and gives no notice of his being employed in behalf of another person, he is to be considered as the principal, and the persons who have dealt with him have the same rights against him as if he actually were so. In an action by the principal on demand arising from such transactions, they may set off a debt due from the agent himself, which they could not have done if they had known that he acted only as an agent. And if he afterwards discloses his principal, he is not discharged from his liability; those with whom he has dealt may either sue him on his personal contract, or the principal upon the contract of his agent.

When a British merchant purchases goods on behalf of a foreign principal, the universal custom is that the credit is given to the British buyer and not to the foreigner; and when a principal resident abroad instructs an agent in England to purchase or order goods for him, the person supplying or manufacturing the goods cannot sue the foreign principal.

An agent is responsible to third persons for any wrongful acts, whether done by the authority of his principal or not; and in most instances the person injured may seek compensation either from the principal or the agent.

An agent cannot delegate his authority to another, but he may employ other persons under him to perform his engagements, and the original agent is responsible to his principal as well for the conduct of such sub-agents as for his own; but with respect to damage sustained by third persons from the wrongful acts of sub-agents, the damages must be recovered either from the person who did the injury or from the principal. The original agent is re-

sponsible to third persons only for his own acts, and such as are done by his command.

If an agent who is intrusted with money or valuable security, with written directions to apply the same in any particular manner, converts it to his own use; or if an agent who is intrusted with any chattel, valuable security, or power of attorney for the transfer of stock, either for safe custody or for any special purpose, without authority sells or pledges, or in any manner converts the same to his own use—he is guilty of a misdemeanour punishable with seven years' penal servitude, or imprisonment for two years, or to fine and imprisonment at the discretion of the court. But this does not prevent his disposing of so much of any securities or effects on which he has a lien or demand, as may be requisite for the satisfaction thereof. It is also a misdemeanour, punishable in the same manner, if a factor or agent employed to sell, and intrusted with the goods or the documents relating to them, pledges either the one or the other as a security for any money borrowed or intended to be borrowed, provided such sum of money is greater than the amount which was at the time due to the agent from the principal, together with any acceptances of the agent on behalf of his principal.

Any agent who is in the possession of goods, or of the documents of title to them, is held in law as the owner, to the effect of giving "validity to any contract or agreement by way of pledge, lien, or security *bonâ fide* made by any person with such agent." The agent may receive back goods or documents which have been pledged for an advance, and may replace them by others; but the lender's lien is not to extend beyond the value at the time of the original deposit. "The documents which are held to authorize the agent disposing of property represented by them, and the transference of which is a sufficient security to the lender, are—any bill of lading, dock-warrant, warehouse-keeper's certificate, warrant or order for the delivery of goods, or any other document used in the ordinary course of business as proof of the possession or control of goods, or authorizing or purporting to authorize, either by indorsement or delivery, the possessor of such document to transfer or receive goods thereby represented." Any agent who is in possession of such documents is considered to be in possession of the goods, and all pledges of such documents are pledges of the goods. An advance of money on the delivery of the goods or documents, pursuant to a written agreement to make such delivery, is valid, although the delivery of the goods or documents does not take place till after the advance. A contract by the agent's clerk, or any person acting for him, is binding. An agent who, contrary to his instructions, and for his own benefit, grants a fraudulent security, is liable to penal servitude, or such other punishment by fine or imprisonment, or both, as the court may award. There are provisions for enabling the owner to redeem his goods while they remain unsold, on satisfying the person who holds them as a security, and for protecting the principal in the case of the agent's bankruptcy.

In Scotland the term agent is applied to all procurators or solicitors, and to all those who take out an attorney's license.

AGENT, ARMY. An official selected by the colonel of a regiment to conduct its monetary arrangements, and for whose honesty he is responsible to the crown. The duties of these agents are to apply monthly to the War Office for the money required for each regiment, and when they have received it to apply it in the payment of the officers, disbursing the regimental paymaster's bills, paying soldiers' remittances for the benefit of their families, and settling the credits of soldiers. The office is one of old standing, but the tendency of recent years has been to curtail its emoluments and functions.

AGENT, NAVY, an official who acts as banker and attorney for naval officers, and who is appointed by the commander of each of Her Majesty's ships of war while in commission. All such agents must be registered, and conduct their business according to rules prescribed by the government. Their duties consist in the management of the monetary affairs of the ship. The names of these officials are to be found in the Navy Lists.

AGENT DE CHANGE, a title given in France to those persons who are appointed by the government to act as stock-brokers, and authorized to act as intermediaries for the transacting of business in the public funds, foreign and commercial securities, and the precious metals.

AGESILAUS II., younger son of Archilamius, king of Sparta, succeeded his half-brother, Agis II., B.C. 398, when he was about forty years of age. It must be understood that when we speak of a king of Sparta we really mean a high hereditary official, whose powers rather resembled those of the consuls at Rome; and like these, there were always two reigning at the same time.

In B.C. 396 Agesilaus undertook a war against the Persians in Asia, the first Greek commander who had led an army thither since Agamemnon. His first object was to conciliate the Greek cities in Asia by prudent management and liberality; and he succeeded in reconciling their factions. A war broke out in Greece after he had been about two years in Asia, during which time he had defeated two Persian generals.

The intrigues of the Persians and the hatred of the Spartan influence had occasioned a dangerous league to be formed against Sparta. (Xenophon, "Hellenic," iii. 5.) Thebes, Argos, and Corinth declared against the Lacedæmonians, and Athens followed the example. The éphori invited Agesilaus home, and on his route he met his enemies near Coroneia in Boeotia, where a fierce battle took place (August, B.C. 394), in which the Spartans obtained only a doubtful victory. The probability of Athens recovering her former power after her walls were rebuilt (B.C. 392), induced the Spartans to send Antalkidas (B.C. 387) with proposals to Persia, favourable to themselves, and disadvantageous to the rest of Greece. These were accepted, and by these unworthy means Sparta recovered her power in Greece.

Agesilaus excused himself on the plea of age from the command of the army sent to reduce Thebes, which had revolted and expelled the Spartans from the citadel, and was seized by Sparta some time before. His place, Cleombrotus, was appointed in his stead. On turning home Cleombrotus left Sphodrias at Thebes in command of part of his army, who misconducted himself, and caused the Athenians to conclude an alliance with Thebes against Sparta. Agesilaus then resumed the command, and was obliged to resign through failing health.

In the battle of Leuctra (B.C. 361) the Lacedæmonians and Cleombrotus were overcome by inferior numbers of Thebes, and the Theban army, increased by the defection of the allies of Sparta, penetrated into Læonia, and laid waste the whole country, B.C. 360. The city, however, saved by the presence of Agesilaus, who shut himself in Sparta, and avoided an engagement. Epaminondas,

Theban commander, did not venture to assault the city, and at last, his allies growing weary of the service, they were approaching, and relief coming to Sparta from Athens, the Theban general retreated.

After the death of Epaminondas at the battle of Mantinea (B.C. 362), in which Agesilaus probably commanded the Spartans, the weariness of all parties produced a cessation of hostilities. Agesilaus was now above eighty years old, but he had still vigour enough left to lead an army into Egypt. After establishing his friend, the Egyptian Nectanebus, in the government of Egypt, the

old king set out on his voyage homewards, loaded with money and presents. Being driven by contrary winds on the coast of Africa, he died there at the age of eighty-four. His attendants preserved the body in melted wax, and took it to Sparta to be buried.

The character of Agesilaus is exalted by Xenophon above its merits. The historian was on terms of personal intimacy with the Spartan king, and was besides no great admirer of the constitutional forms of Athens, his native city, which he loved to contrast disadvantageously with those of Sparta. Personal friendship thus triumphed over the historian's patriotism. Perhaps a juster appreciation of Agesilaus is formed by Plutarch and Cornelius Nepos.

AGES OF THE WORLD. In the mythology of the Greek and Roman poets the history of the world was divided into four ages—the golden, the silver, the brazen, and the iron; as, for instance, by Hesiod in his poem entitled "Works and Days," and by Ovid in his "Metamorphoses" (book i.) The golden age, when Saturn reigned, is represented as having been that of perfect innocence and happiness, from which the others gradually degenerated, the iron age being the most wicked and miserable of all. Sometimes these ages are spoken of as merely so many successive periods in the history of Italy. Saturn having been driven out of heaven by his son Jupiter, is supposed to have sought an asylum in that country, where, in return for the protection he received from King Janus, he taught him and his people agriculture and the other arts of cultivated life. According to this latter mode of telling the story, the golden age is represented as consisting in the triumph of civilization over previous barbarism; whereas the other version seems intended to indicate that the primeval state of man was that in which he enjoyed the greatest felicity. A definite period of history distinguished by some special characteristic is frequently entitled an age; and we speak of the Augustan age, the Elizabethan age, or of the middle ages, the dark ages, &c. The term is also applied by scientific men to stages in civilization, as shown by tools and weapons; thus we speak of the stone age, the bronze age, and the age of iron. Some of the metaphysical philosophers of Germany and the Positivists of France also attempt to divide history into definite states or periods. See FICHTE, HEGEL, COMTE.

AGGERHUUS, better known as CHRISTIANIA, one of the divisions of the kingdom of Norway, of which it is the most important on account of its mines, commerce, and agriculture.

AGHRIM, or **AUGHRIM**, a village in the county of Galway, in Ireland, famous for the victory obtained in its neighbourhood, 12th July, 1691, by the forces of King William III., commanded by General Ginkell, over those of King James II., commanded by the French general St. Ruth. The latter were 25,000 strong, and very advantageously posted; the former amounted only to 18,000, and had to march to the attack through a bog, in which they sunk up to the middle. The result was in a great measure owing to the death of General St. Ruth by a cannon ball in the early part of the action, and to the officer who took the command having, through a jealousy which subsisted between them, been left in ignorance of the dispositions of his superior. The victors followed up their success with a terrible slaughter of the defeated and flying enemy; no fewer than 7000 are said to have been destroyed. Only 450 prisoners were taken. The loss of the English did not exceed 700 killed and 1000 wounded. This victory was followed by the complete submission of Ireland. In Archdall's "Monasticon Hibernicum" it is stated, that there was formerly a priory of canons regular of St. Augustine at Aghrim, which was said to have been founded in the thirteenth century. Aghrim is in the barony of

Kilconnell, 28 miles east from the town of Galway, and 75 west from Dublin. The village is now much decayed, and has a population of only 400. There is also a parish of the same name in county Roscommon.

A'GINCOURT, or **A'ZINCOUR**, a village in the department of Pas de Calais, France, in the ancient province of Artois, celebrated for a great victory obtained by the English, under Henry V., over a French force vastly superior in numbers. The English king, in 1415, conveyed over to Normandy (the hereditary possession at one time of his ancestors) a considerable army, and having reduced the town of Harfleur, near Havre, set out for Calais. The siege of Harfleur occupied thirty-six days; and the loss sustained by the English, principally by sickness, during this period, was immense. Upon reaching Abbeville and Amiens, Henry found the passes of the Somme guarded, and the bridges broken down; but, having erected a temporary bridge at a place called Nesle, he passed his army over, and, pursuing his route, came to an engagement with his opponents on the 25th of October. The disparity of forces was very great. No ancient English writers make the number of Henry's forces more than 10,000. The accounts of the number on the other side vary from 50,000 to 150,000. The descriptions of this great battle present many remarkable circumstances, some of which, founded upon the chronicles, are familiar to every reader of Shakspeare. The loss of the respective armies is variously stated: that of the French was probably 10,000, including the Constable, three dukes, five counts, and ninety-two barons. The victors lost about 1600, including the Duke of York, the Earl of Suffolk, and one or two other persons of rank. Henry continued his march to Calais, which he reached on the 29th, and thence proceeded to Dover and London, which he entered with great pomp on the 23rd of November.

A'GIO, a term used sometimes to express the variations from fixed parts or rates of exchange, but more generally to indicate by percentages the differences in the valuations of moneys. The Italian word *aggio* is explained to mean "an exchange of money for some consideration." Thus, if a coin is reduced in weight, and the real is not equal to the nominal value, the difference is the *agio*.

Where it is in the power of the state to prevent the degradation of the coin below the standard, no calculations of *agio*, strictly so called, are rendered necessary. In some states the currency is made up of the deteriorated coins of the neighbouring countries with which the inhabitants have dealings. Under these circumstances banks were at different times established by the governments of Venice, Hamburg, Genoa, Amsterdam, &c., which, under the guarantee of the state, should be at all times bound to receive deposits and to make payments, according to some standard value. The money or obligations of these banks bear a premium equivalent to the deterioration, and this premium is called the *agio* of the bank.

As the current coins of every country have a kind of medium value at which they are generally taken, the term *agio* is also applied to express what must be paid over and above this medium value. The kinds of money on which, in the case of exchange, an *agio* is paid, are not always the more valuable intrinsically, but those which are most in request.

The term *agio* is also used to signify the rate of premium which is given when a person, having a claim which he can legally demand in only one metal, chooses to be paid in another. Thus, in France, silver as well as gold is a legal standard, and payments may be made entirely in silver coin—a circumstance which is found to be so practically inconvenient that the receiver will frequently pay a small premium in order to obtain gold coin, which is more easily transportable. This premium is called the *agio* on gold.

Out of Italy the term *agio* is most in use in Holland, and in several German commercial cities.

A'GIS, the name of four kings of Sparta, the first of whom reigned about 1032 B.C., and by whom the inhabitants of Helos were subdued and made vassals or slaves. The second, the predecessor of the celebrated Agesilaus II., reigned from 427 to 398 B.C., and the third from 338 to 330 B.C. This is he who took advantage of Alexander's absence in Asia to try and overthrow the supremacy of Macedon, but met his death in the battle which saw the ruin of his brave attempt. Agis IV. came to the throne in 244 B.C., when the state was in a ruinous condition, owing to the selfish conduct of the aristocracy, who had succeeded in gaining possession of nearly the whole of the land while the poor were overwhelmed with debt. He made strenuous efforts to bring about a reform, but was vehemently opposed by his fellow-king and the rich and haughty members of the community; and after a troubled reign of four years he was strangled in prison, his mother and his grandmother, who had been admitted to visit him, sharing the same fate. His history and death form the subject of a tragedy by the Italian poet Alfieri.

AGNA'NO, a remarkable lake basin near Naples, on the road leading to Pozzuoli and Baia, and entirely surrounded by hills rising in the form of an amphitheatre. It was an old crater of irregular shape, and about 2 miles in circumference. The water produced malaria, and the lake was drained in 1870. The gain, in a sanitary point of view, is very doubtful, whilst the beauty of the landscape is sadly impaired. Near the dried-up lake are the natural vapour-baths of San Geronimo, which are beneficial in cases of rheumatism and gout. On the opposite side is the famous Grotto del Caia, filled with carbonic acid gas, which has the power of depriving a dog or other animal of all sensation in a few minutes. There is no mention in the ancient writers either of Agnano or of the Grotto, but Pliny the Elder says in his "Natural History," that in the country about Puteoli there were vents in the ground from which deadly vapours arose.

AG'NATES (Latin, *agnatus*), in English and Scotch law, is the name given to persons related through the father, those related through the mother being termed *cognates*. In Roman law agnates were persons related through males only. Thus a brother's son was his uncle's agnate, but a sister's son was his uncle's cognate—a female link having intervened. The origin of this distinction in Roman law is to be found in the institution of the *patria potestas*, which has not been adopted by any modern society.

AGNESI, MARIA GAETANA, was born at Milan in 1718. When very young she distinguished herself by the acquisition of various languages, and is said to have understood Latin, Greek, Hebrew, French, German, and Spanish. She then turned her attention to mathematics and philosophy, and at the age of nineteen wrote in defence of 191 theses, which were published in 1738 under the title of "*Propositiones Philosophicæ*." In 1748 she published her celebrated work, "*Istituzioni Analitiche all'Uso della Gioventù Italiana*," in two volumes 4to. The first volume contains the elements of algebra, with the application of algebra to geometry; the second contains an excellent treatise on the differential and integral calculus. In 1750 her father, who was then a professor in the University of Bologna, being ill, she obtained permission from Pope Benedict XIV. to supply his place. She finally retired into a convent, and died in 1799, aged eighty-one.

AGNOSTICS, the name applied to those who hold that we have no true knowledge but that of experience, or, in other words, that which we can acquire by means of our senses. Those who hold this philosophical position deny the possibility of intuitive conceptions (but not, of course,

of inherited tendencies), and of revelation in any form. The most striking instances of agnosticism in our day are the **POSITIVISTS** [see **COMTE**]. Religious agnosticism, however, is at least as old as Plato (B.C. 400), and its main principle has never been more forcibly expressed than by him—"Speculations about the gods are simply speculations about the opinions men form about the gods" (*Dialogue "Cratylus"*). Religious agnosticism, or the confession of ignorance, is evidently quite distinct from atheism, the denial of the existence of God.

AGNUS DEI (Latin, Lamb of God), one of the titles of Christ (John i. 29); also one of the principal parts of the mass in the Roman Catholic Church; and hence the name of the musical setting of that part of the service. The words "O Lamb of God, have mercy upon us, grant us peace" demand, and always receive the most expressive music of which the composer is capable.

The name is also given to medals of gold and silver of an oval shape, stamped with the image of a lamb bearing a cross, and to similar medals made of the wax of the Easter candles. These were formerly blessed by the pope and distributed after Easter, and were highly prized as amulets or charms. They are now only distributed on the accession of a pope, and at intervals of seven years, to distinguished members of the church. In the Greek Church the name is given to the cloth used to cover the communion cup, which is ornamented with the same figure.

AGOSTA, or **AUGUSTA**, a seaport town on the south-east coast of Sicily, about 12 miles N. of Syracuse. The town was built in the thirteenth century by the Emperor Frederick II. on a low peninsula connected with Sicily by a long narrow causeway. The harbour formed by this projection is one of the safest and most sheltered in the island of Sicily. This town suffered from an earthquake in the year 1693, by which it was nearly reduced to ruins, and it has never since recovered the degree of importance which it previously enjoyed. Near here, in 1676, the Dutch fleet was defeated by the French, and their admiral, De Ruyter, killed. The place is slightly fortified on the land side, and protected towards the sea by three forts. The trade of Agosta is in wine, olive-oil, salt, and honey. The remarkable caves of Timpa are in its vicinity. Population about 12,000.

AGOUTI (*Dasyprocta*), a genus of quadrupeds belonging to the order **RODENTIA**. The agoutis are natives of the warmer parts of America and the West India Islands. They are found in Brazil, Paraguay, Guiana, the Antilles, and Bahamas, and in their favourite localities often abound in considerable numbers. The agoutis have four toes on each of the anterior limbs: of these the outermost on each side is small, and seated high, while the two middle are long, and armed with stout claws; the hind feet are divided into three toes, furnished with claws of a hook-like character, and of considerable strength. The limbs are slender, and the hinder pair considerably exceed the anterior in length. Hence the pace of these animals is rapid for a short distance, and they leap with considerable agility; they seldom, however, trust to speed for safety, but seek shelter and security in the hollow of a tree or under a rock, and allow themselves to be captured without offering any resistance, only uttering a sharp, plaintive note of alarm. The head of the agouti is large, the forehead convex, the nose swollen, the ears round, short, and nearly naked; the eyes large and black; the tail short, and often a mere tubercle. The hair is glossy, of a wiry character, and mottled in different degrees with black, yellow, or red, and olive-green. The molar teeth are four on each side, above and below, all nearly of the same size and when worn presenting winding folds of enamel on the flat crowns. In some districts the flesh of these animals is esteemed, being white and tender. The agoutis

use the fore paws as hands to convey the food to the mouth, and usually sit upright on their haunches to eat; they also frequently assume the same attitude in order to look around them when anything occurs to excite suspicion or alarm. Their food is exclusively of a vegetable nature, and consists for the most part of wild yams, potatoes, and other tuberous roots. In the islands of the different West India groups they are particularly destructive to the sugarcane, feeding on the root, of which they are very fond. Hence the planters employ every artifice for destroying them, so that at present they have become comparatively rare in the sugar islands, though on the first settlement of the Antilles and Bahamas they are said to have swarmed in multitudes, and to have constituted a principal article of food among the aborigines. They were the largest of the quadrupeds found upon these islands on their first discovery.

Though the agoutis use their fore paws in holding their food and in scraping up roots, they neither climb trees nor make burrows, but resort to the hollows of decaying timber, or logs, or to similar retreats, in order to conceal themselves and rear their young. The young are born with the eyes closed, but soon become capable of shifting for themselves.

Several species of this genus are described as the common agouti (*Dasyprocta aguti*), a native of the wooded districts of Brazil and Guiana, where it is destroyed in great numbers for the sake of its flesh. It is found also in Paraguay, and in St. Lucia, St. Domingo, and other adjacent islands. This species appears to be gregarious, associating in small troops of eighteen or twenty individuals, which make the hollow of a tree their common residence. They seldom appear abroad except towards the dusk of evening and during the hours of night; and are abrupt, active, prompt in their movements, bounding rapidly along when disturbed to regain their hiding-place. The common agouti breeds several times in the course of the year, producing from three to six at a birth. It is preyed upon by carnivorous quadrupeds and birds, which are ever ready to pounce upon it. In bulk the agouti equals a moderate-sized hare; its general colour is grizzled reddish-brown, tinged on the neck, chest, and under parts with yellow. On the lower part of the back the hairs are long and of a golden yellow.

Among other species we may notice the black agouti (*Dasyprocta cristata*). This species is considerably



Black Agouti. (From F. Cuvier.)

smaller than the common, being about the size of a rabbit; it is of a nearly uniform black colour, but the hairs about the cheeks and sides are speckled with white. The black agouti is a native of Surinam, Guiana, and Brazil.

The acouchy (*Dasyprocta acouchy*) is a small but very elegant species of this group of rodents found in Guiana, the north of Brazil, and the islands of St. Lucia and Granada. It is at once to be distinguished from the other agoutis by the possession of a slender tail, upwards of 2 inches in length, instead of a mere tubercle. The acouchy is very active, leaps with great address, and is lively and easily tamed. Its voice is a short, sharp, plaintive cry. This species is the olive cavy of Pennant.

AGRA, a division, district, and city in the North-western Provinces of British India. The division embraces the districts of Agra, Etah, Etawah, Furruckabad, Mainpuri, and Muttra, having together an area of 9899 square miles, with a population in 1881 of 5,200,000.

AGRA, the district, is bounded on the north by Muttra, on the south by the Dholpur and Gwalior territories, on the east by Mainpuri and Etawah, and on the west by Bhartpur state. It lies between $25^{\circ} 35'$ and $26^{\circ} 18'$ N. lat., and has an area of about 1900 square miles. The chief rivers are the Ganges, the Jumna, and the Chambul, and there are some smaller streams; yet the country is ill supplied with water, obtained to a considerable extent from wells. North of the Chambul the country is for the most part flat and badly timbered, but on the other side of that river, and towards the north-western quarter of the district, the surface is somewhat hilly, and more plentifully covered with trees. The climate during a part of the year approaches to temperate, and in the winter months may even be pronounced cold; but during April, May, and June the prevalence of hot winds, to which the whole of central India is occasionally liable, renders the heat almost insupportable. The district is not, however, considered unhealthy.

The soil is in general well adapted for the production of indigo, sugar, and cotton. The country between the Ganges and the Jumna, called the Doab, is the most fertile part of the district, and furnishes all these articles for export. Rice is but little cultivated, owing to the scarcity of water. Some coarse cloth is manufactured, principally for home use, and fine muslins and silks were formerly made to a large extent, but these branches of industry have now much diminished by the introduction of British manufactures. The population in 1881 was 1,100,000.

AGRA, the capital of the above district, is situated on the western bank of the river Jumna. The city, which is held in great veneration by the Hindus, was founded by the Emperor Akbar in 1566; it was previously little more than a village. He changed the name to Akbarabad, greatly enlarged the city, and built a very large fort surrounded with high walls, which still remains, as well as his palace overlooking the Jumna. The city continued to be the seat of the Mogul emperors till 1647, when Delhi was constituted the capital by Shah Jehan, from which period Agra declined in importance. It is now, however, the second city in size and importance of the North-western Provinces. The population in 1881 was 150,000. Of the public buildings in the city, besides the palace, one of the most beautiful is the Moti Masjid, or Pearl Mosque, of white marble, covered with sculptures, or rather stone carvings, of the most delicate simplicity and elegance. About 5 miles from the city, on the west bank of the Jumna, is the Taj Mahal, a mausoleum built by Shah Jehan to the memory of his wife, Arjmand Banoo, and in which he is also interred. It is surrounded by a garden, which, as well as the tomb itself, is kept in excellent order by the British authorities, who have a garrison and civil establishment in Agra. The building, which is of white marble, is elevated on a terrace of white and yellow marble; it has four tall marble minarets at its four angles, and is surmounted by a dome. It is one of the most beautiful specimens of Mohammedan ornamental architecture in the world. The building occupied 20,000 men for twenty-two years, and cost over £5,000,000. The other chief buildings are the Oriental College, Government House, and the Metcalfe Testimonial. The city has lately been much improved, and is the centre of a considerable commerce; the chief articles of export being raw silks, indigo, and coarse sugar. In 1803 Agra was bombarded and taken by Lord Lake. During the Indian mutiny in 1857 the Sepoys gained possession of the city, but were foiled in their

attempts against the fort or residency, in which the European and Christian community had taken refuge.

Agra is connected by railway with Calcutta, 783 miles distant; also with Bombay, 669 miles; and with Delhi, 139 miles.

AGRAM, or **ZAGRAB**, the capital of Austrian Croatia, is a fortified town, situated on an eminence near the Sava, about 150 miles nearly due south of Vienna. It is the seat of a bishop, and the residence of the ban or governor of Croatia. The town is divided into three parts, one of which is under the episcopal authority. In addition to its ancient cathedral, Agram possesses an academy, museum, public library, grammar-school, and Franciscan convent. Most of the public buildings, including the fine cathedral, were very much damaged by a severe earthquake which occurred in 1880, causing great havoc and suffering both throughout the town and in various places in the country round, though providentially the loss of life in Agram itself was small. The population is about 20,000. Porcelain and silk are manufactured, and a trade is carried on in tobacco and corn.

AGRA'RIAN LAWS (*agrarie leges*). Those enactments were called agrarian laws by the Romans which related to the public lands (*ager publicus*). The objects of these agrarian laws were various. A law (*lex*) for the establishment of a colony and the assignment of tracts of land to the colonists was an agrarian law. Those laws, also, which assigned to the plebeians small allotments of the public lands, varying in amount from 2 jugera to 7 jugera (a jugerum is about three-fourths of an English acre), were among the most important of the agrarian laws. But the law which limited the amount of public land which a man could hold and enjoy without having the ownership, are those usually meant when the term agrarian laws is now used.

The origin of the Roman public land, or of the greater part of it, was this:—Rome had originally a small territory, but by a series of conquests carried on for many centuries she finally obtained the political dominion of the whole Italian peninsula. When the Romans conquered an Italian state they seized a part of the lands of the conquered people; for it was a Roman principle that the conquered people lost everything with the loss of their political independence; and what they enjoyed after the conquest was a gift from the generosity of the conqueror. A state which submitted got better terms than one which made an obstinate resistance. Sometimes a third of the land was taken from the conquered state, and sometimes two-thirds. It is not said how this arrangement was effected; whether each land-owner lost a third, or whether an entire third was taken in the lump, and the conquered people were left to equalize the loss among themselves. But there were probably in all parts of Italy large tracts of uncultivated ground which were under pasture, and these tracts would form a part of the Roman share, for we find that pasture-land was a considerable portion of the Roman public land. The ravages of war also often left many of the conquered tracts in a desolate condition, and these formed part of the conqueror's share. The lands thus acquired could not always be carefully measured at the time of the conquest, and they were not always immediately sold to the citizens or assigned, that is, allotted and marked out by bounds (*signa*). The Roman state retained the ownership of such public lands as were not sold or given in allotments, but allowed them to be occupied and enjoyed by any Roman citizen (or probably by the patricians only at first, and in some cases certainly by the citizens of allied and friendly states), on the payment of a certain rent, namely one-tenth of the produce of arable land and one-fifth of the produce of land planted with the vine, fig, olive, or with trees valuable in some other way, as the pine. Public

notice was given that the lands might be occupied on such terms as above mentioned. The patricians originally claimed the sole right to the enjoyment, but the plebs participated in it after the date of the Licinian laws. Such an arrangement would certainly be favourable to agriculture. The state would have found it difficult to get purchasers for all its acquisitions; and it would not have been politic to make a free gift of all those conquered lands which, under proper management, could furnish a revenue to the state. Those who had capital, great or small, could get the use of land without buying it, on the condition of paying as rent a moderate proportion of the produce. The state, as already observed, was the owner of the land; the occupier, who was legally entitled the possessor, had only the use (*usus*). This is the account of Appian ("Civil Wars," i. 7, &c.) The account of Plutarch ("Tiberius Gracchus,") so differs in some respects.

This mode of occupying the land continued for a long period. It is not stated by any authority that there was originally any limit to the amount which an individual might occupy. In course of time these possessions (*possessionses*), as they were called, though they could not be considered by the possessors as their own, were dealt with as if they were. They made permanent improvements on them, they erected houses and other buildings, they bought and sold possessions like other property, gave them as portions with their daughters, and transmitted them to their children. There is no doubt that a possessor had a good title to his possession against all claimants; and there must have been legal remedies in cases of trespass, intrusion, and other disturbances of possession. In course of time very large tracts had come into the hands of wealthy individuals, and the small occupiers had sold their possessions, and in some cases, it is said, had been ejected, though it is not said how, by a powerful neighbour. This, it is further said, arose in a great degree from the constant demands of the state for the services of her citizens in war. The possessors were often called from their fields to serve in the armies, and if they were too poor to employ labourers in their absence, or if they had no slaves, their farms must have been neglected. The rich stocked their estates with slaves, and refused to employ free labourers, because free men were liable to military service, and slaves were not. The free population of many parts of Italy thus gradually decreased, the possessions of the rich were extended, and most of the labourers were slaves. The Roman agricultural slave was hard-worked, and an unfeeling master might contrive to make a good profit out of him by a few years of bondage; if he died, his place could readily be supplied by a new purchase. Such a system of cultivation was profitable to a few wealthy capitalists, and insured a large amount of surplus produce for the market; but the political consequences were disastrous.

The first proposition of an agrarian law, a measure, as Livy (ii. 41) observes, which was never proposed up to his time (the period of Augustus) without exciting the greatest commotion, was that of the consul Spurius Cassius, B.C. 484. Cassius failed in his measure, was tried on some charge of treasonable designs, condemned, and executed.

In B.C. 375 the tribunes C. Licinius Stolo and L. Sextius brought forward, among other measures, an agrarian law (the Licinian Rogations), which after ten years' opposition was carried in the year B.C. 365. The exact provisions of this law have been the subject of much speculation among modern scholars; but the main object, as stated by the ancient authorities, was to limit the amount of public land which an individual could possess (that is, enjoy).

About 230 years after the passing of the Licinian Rogations the tribune Tiberius Sempronius Gracchus, who was of a plebeian but noble family, brought forward his

agrarian law, B.C. 133. The same complaints were still made as in the time of Licinius: there was general poverty, diminished population, and a great number of slave labourers. His object was to restore the limitation which Licinius had put on the enjoyment of public land, and to distribute among the poor in small allotments what remained after the law was enforced. Tiberius Gracchus lost his life in a tumult which was caused by the opponents of his measures, which had been only partially effected (Plutarch, "Tib. Gracchus").

Caius Gracchus, who was tribune B.C. 123, renewed the proposals of his brother. He carried measures for the establishment of several colonies, to be composed of citizens who were to receive grants of land. A variety of other measures, some of undoubted value, were passed in his tribunate. Caius was murdered by the party of the nobility, B.C. 121, when he was a third time a candidate for the tribunate.

The agitation for agrarian laws and division of land among the poor was renewed at intervals after the death of Caius Gracchus, and generally by those who were seeking popular favour. In B.C. 60 the tribune Flavius brought forward an agrarian law, at the instigation of Pompey, who had just returned from Asia and wished to distribute lands among his soldiers. Cicero, in a letter to Atticus (i. 19), says of this measure, "One part of the law I made no opposition to, which was this, that land should be bought with the money to arise for the next five years from the new sources of revenue (acquired by Pompey's conquest of Asia). The senate opposed the whole of this agrarian measure from suspicion that the object was to give Pompey additional power, for he had shown a great eagerness for the passing of the law. I proposed to confirm all private persons in their possessions, and this I did without offending those who were to be benefited by the law; and I satisfied the people and Pompeius, for I wished to do that too, by supporting the measure for buying lands. This measure, if properly carried into effect, seemed to me well adapted to clear the city of the dregs of the populace, and to people the wastes of Italy." A disturbance in Gallia Cisalpina stopped this measure of Flavius; but it was reproduced, as amended by Cicero, by C. Julius Cæsar, who was consul in the following year, B.C. 59. The measure was opposed by the senate, on which Cæsar went further than he at first intended, and included the *Stellatis Ager* and Campanian land in his law. This fertile tract was distributed among 20,000 citizens who had the qualification which the law required, of three children or more. Cicero observes ("Ad. Attic." ii. 16), "that after the distribution of the Campanian lands and the abolition of the customs duties (*portoria*), there was no revenue left that the state could raise in Italy except the twentieth which came from the sale and manumission of slaves." After the death of Julius Cæsar his great nephew Octavianus (Augustus), at his own cost and without any authority, raised an army from these settlers at Capua and the neighbourhood, overawed the senate into confirming this illegal proceeding, and extorted a commission to prosecute the war against Mark Antony. Those who had received lands by the law of the uncle supported the nephew in his ambitious designs, and thus the settlement of the Campanian territory prepared the way for the final abolition of the Republic. (Compare Dion. Cassius, xxxviii. 1-7, and xlv. 12.)

The character of the Roman agrarian laws may be collected from this sketch. They had two objects: one was to limit the amount of public land which an individual could enjoy; the other, and in the later Republic, the main object of the agrarian laws, was to distribute public land from time to time among the poorer sort and veteran soldiers.

The allotments probably seldom exceeded 7 jugera, about 5 English acres, and were often less. The object of Tiberius Gracchus in this part of his legislation is clearly expressed; it was to encourage men to marry, and so to supply the state with soldiers. This appeared the duty of a wise legislator. There is no evidence to show what actually was the effect of these allotments on agriculture. The ordinary result would be, if the lands were well cultivated, that enough might be raised for the consumption of a small family; but there would be little surplus for sale or for the general supply, and no means of employment for an increasing population. These allotments might yet, however, completely fulfil the purpose of the legislators. War, not peace, was the condition of the Roman state, and the wars kept up a constant drain of males—a condition in which a country is frequently observed to keep up and even to increase its numbers. What became of the surplus female population accruing under this system the absence of all evidence renders it not easy to conjecture. It is not stated how these settlers obtained the necessary capital for stocking their farms, but we read in Livy that on one occasion the people were indifferent about the grants of lands, because they had not the means of stocking them; and again, that the bequest to the Roman people of the last Attalus, king of Pergamus, was to be divided among the poor who had received grants of lands.

The nature of the agrarian laws, particularly those of Licinius and the Gracchi, was for a long time entirely misunderstood. For some centuries after the revival of letters the opinion generally prevailed among scholars that the agrarian laws implied the limitation of property in land, and the division among the poorer citizens of the estates of private individuals which exceeded a legal limit. During the violence of the French Revolution a scheme for the equal division of the land of the country was propounded and eagerly supported by some of the popular leaders, who aimed at influence and power. They endeavoured to sustain their proposal by arguments and precedents drawn from Roman history, especially the agrarian laws referred to. In 1793 the French Convention passed a law making any one who should advocate an agrarian law liable to the penalty of death, it being plainly understood that this was held to imply an equal division of the soil among all the citizens. The subject was thus brought into prominence, and was investigated afresh by some of the leading scholars of Germany, one of whom—Professor Heyne, of Göttingen—in a paper addressed to his university in the year 1793, showed that the ancient laws had been entirely misunderstood, and pointed out their true interpretation. Other writers, as Heeren, Hegewisch, and Savigny, accepted and further illustrated this view; and Niebuhr, in his "Roman History," gave the subject a full examination, and completely demonstrated the fact that "the agrarian laws of the Romans were in no case intended to interfere with or affect private property in land, but related exclusively to the public domain."

In addition to these enactments of the Romans, the term is sometimes used to include the laws of other nations relating to property in land. In the republics of ancient Greece and the Grecian settlements various laws were made regulating the possession of the soil. The law of the Hebrews was very elaborate in its details on this subject. By this law the cultivators of the soil were required to allow their land to lie fallow every seventh year, and during this year the spontaneous produce was to be held as common property. At the end of seven times seven years the year which followed was to be held as a year of jubilee, and all lands which had been sold or mortgaged were to be restored again to the original possessor or his heirs, free of encumbrance, the only exception to this being in the case of houses built in walled cities.

The details of these laws are to be found in the book of Leviticus, and they are very frequently referred to in the other books of the Old Testament. They seem to have been intended to encourage economy and foresight, and still more for the protection of the poor against the encroachment and tyranny of the rich. It is not easy to ascertain how far these laws were ever carried out in practice, but that they were frequently disregarded is evident both from the historical and prophetic writings.

The latest contribution to agrarian laws in the United Kingdom are the Agricultural Holdings Acts (England and Scotland) of 1883. Compensation by the landlord for tenants' improvements is recognized by these laws as a right inalienable in ordinary cases by contract. The amount of compensation payable is defined to be "such sum as fairly represents the value of the improvement to an incoming tenant," it being stipulated, however, that in assessing the increased value of any holding account shall not be taken, as part of the improvement made by the tenant, of what is justly due to the inherent capabilities of the soil. For the execution of any permanent improvements the landlord's consent is required; temporary improvements can be carried out without consent; while for drainage works, an intermediate class, the tenant is required to give notice to the landlord, with the option to the latter of executing the work himself, and charging interest on the outlay.

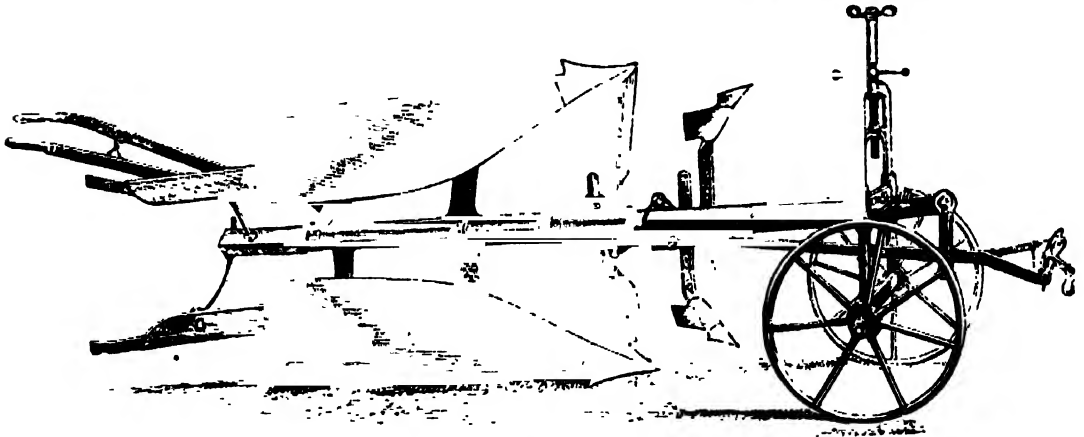
AGRICOLA, CNEUS JULIUS, an able and enlightened Roman general and statesman, was born on the 13th of June, A.D. 37, at Forum Julii, now Fréjus, then a city of considerable celebrity. His father, Julius Gracinus, a Roman senator and a distinguished orator, was put to death by Caligula for refusing to conduct a calumnious prosecution against Silanus, the tyrant's father-in-law, but intended victim. After receiving his education at Massilia (Marseilles), the principal seat of learning in Gaul, he was sent to Britain, and served under Suetonius Paulinus at the time of the revolt of BOADICÆA. In A.D. 62 Agricola returned to Rome, where he married Domitia Decidiana, a lady of rank, was elected questor, and received Asia for his province. During the latter part of Nero's reign Agricola, knowing the jealousy of the emperor, and remembering the fate of his father, avoided all appearance of ostentation and ambition, although he held the highest offices of state. On the accession of Galba, A.D. 68, he was selected as a commissioner to examine the state of the treasures belonging to the temples, and to restore to them whatever had been taken away; for under Nero the valuable gifts consecrated in the temples had been often seized to fill the empty coffers of the prince. Later, at the commencement of the contest for the empire between Otho and Vitellius on Galba's death, his mother was murdered by a detachment from Otho's fleet; and as Agricola was hastening to pay the last offices to his mother, he learned that Vespasian had been proclaimed by the legions in the East. He instantly declared in his favour, and was soon rewarded by the command of the twentieth legion in Britain. 70. He returned to Rome about 73, was enrolled by the emperor among the patricians, and soon after appointed governor of Aquitania, a province which included all the south-western part of Gaul from the Pyrenees to the Loire. He was recalled to receive the honour of the consulship in 77, and was then appointed governor of Britain, whither he proceeded the following year. Agricola passed seven or perhaps eight summers in Britain, in the first of which he added North Wales and the island of Anglesey to the Roman province. By the end of the fourth campaign the whole island south of the Clyde and the Forth was secured to the Romans by a line of forts running from the one estuary to the other. Every summer extended the dominion

of the Roman arms, and the subtler but more enduring dominion of the Roman civilization, but it was only in the last year of his government that he entirely broke the spirit of the Britons by the defeat of Galgacus at the Grampian Hills, A.D. 84. At the close of this campaign a Roman fleet sailed round the island. The splendid successes of Agricola, which would have been welcome to the high-minded Vespasian, had he been still living, were, however, unpalatable to his quite unworthy son, the suspicious Domitian; and Agricola was honourably recalled, under the pretext of being sent as governor to Syria. By order of Domitian he entered Rome at night, and after a cold reception by the emperor he quietly retired into private life. He died in the autumn of A.D. 93, in the fifty-seventh year of his age, not without some suspicion of poison. We know accurately the career of this truly distinguished man, to whom Britain especially owes so much, from the superb biography, a model of art, which his son-in-law the great historian Tacitus, has left us.

AGRICULTURAL IMPLEMENTS. Few of the productive arts have made more signal progress within recent years than those which relate to the cultivation of the soil. This progress may be attributed to several causes—such as the repeal of the corn laws, by which the British farmer was placed in full competition with the

foreigner, and was thus compelled to rely more on his own resources; the growth of agricultural chemistry; the exertions of the Royal Agricultural Society, which in numerous ways greatly encouraged the invention and improvement of implements and machines of all kinds; the increase of emigration, and the tendency of the labouring population to prefer a town to a country life, which would at times seriously interfere with agricultural operations were not the farmer provided with improved and labour-saving implements.

The *Plough* is without doubt the first agricultural implement that was ever made, and the first labour-saving machine. As it took the place of the spade or fork, it has been designed to cut and turn over a portion of the soil, to pulverize and expose it to the action of the sun, of the air, and of water. Being a first necessity of agriculture in every part of the world, every country has made its own plough, specially suited to its own requirements. Hence the great variety of forms in which it is found. The oldest forms of the plough of which we have any description in ancient authors, or which are represented on monuments or coins, are very simple; a mere wedge with a crooked handle to guide it, and a short beam by which it was drawn, form the whole instrument. The light Hindu plough, still in use in many parts of India, seems to



Turn-wrest Plough.

differ little from the old model. Various forms of plough are represented in some of the most ancient Assyrian and Egyptian sculptures. Among the Greeks and Romans ploughs of different shapes were used, some of them showing much skill in their make. Roman ploughs are represented on Plate I. figs. 1, 2, 3, and 4. Great improvements are observable in the Norfolk ploughs, and in that invented by Lord Somerville, which were in great use in the early part of the present century, and of which illustrations are given in figs. 1, 2, and 3, Plate II.

But in most striking contrast to the old Roman ploughs are the latest productions of such makers as Howard, Hornby, and Ransome, shown in Plate III. figs. 1, 2, 3, 4, and which represent the perfection to which modern ploughs have been brought. Their chief features and advantages are that the beam, handles, and frame are made of one solid continuous piece of wrought iron, by which great strength, lightness, and durability are obtained. No dirt can get into the joints to interfere with the work; there is but little liability of the plough deviating from a straight line, it easily follows any small undulations of the soil, makes the depths of the furrows more regular, and the average friction of the soil is reduced to a minimum.

The different essential parts of a plough have certain

names usually given to them. The *body* is that part to which all the other parts are attached. The bottom of it is called the *sole* or *slade*; to the fore part of which is affixed the *point* or *share*; the hind part of the sole is called the *heel*. The *beam*, which advances forward from the body, serves to keep the plough in its proper direction, and to the end of it are attached the oxen or horses employed to draw it. Fixed in the beam, in a vertical position, before the point of the share, with its point a little forward, is the *coulter*, which serves to cut a vertical section in the ground, while the point of the share, expanding into a *fin*, separates a slice by a horizontal cut from the subsoil or solid ground under it. The *mould-board*, or *turn-furrow*, is placed obliquely behind the fin, to the right or left, in order to push aside and turn over the slice of earth which the coulter and share have cut off; it thus leaves a regular furrow wherever the plough has passed, which furrow is intended to be filled up by the slice cut off from the land by the side of it, when the plough returns. The *stills*, or handles, of which there may be either one or two as is thought more convenient, direct the plough by keeping it in the line required and at a regular depth in the ground. The single stilt appears to be the most ancient form. The *wheel*, or wheels, are for

regulating the width and depth of the ploughing. Wheels are a modern invention in comparison with the other parts, but their advantages over the old form of swing plough have insured their general adoption. They support the end of the beam, and prevent it from going too deep in the ground or rising out of it while the plough is going on. As, however, it was found that wheel ploughs were sometimes inferior to swing ones in ploughing cloddy ground, or in crossing steep ridges, and that they could not be used for forming drills for turnip or other crops, the best ploughs are so made that the wheels can be laid aside at pleasure, and they can then be used in all respects as swing ploughs. Other important improvements introduced into modern ploughs are in the shape of the mould-board or turn-furrow, and the contrivances for regulating the line of draught, so as to make the plough go at an equal depth, and cut off a regular slice of equal breadth, without any great force being applied by the ploughman who holds the stils.

The mould-board of a plough is either fixed on one side, or made so as to shift from one side to the other. In the first case half the furrow-slices lie on one side and half on the other, and there is of necessity a double furrow where they join. When it is desirable that the surface should be quite flat, and the furrow slices all in one direction, the mould-board must be shifted at every turn, and a plough which admits of this is called a Turn-wrest Plough. (See Engraving on opposite page.)

Ploughs were formerly made of wood, having those parts covered with iron where the greatest friction takes place, the share and coulter only being of iron; but in consequence of the greater facility of casting iron in modern times, most of the parts are now made of this metal. The advantages of iron are, its durability and the smaller friction it occasions when once polished by use. The inconveniences are, the additional weight of the instrument, and consequent greater friction of the sole. This, however, has been largely obviated by the greater lightness which improvements in the manufacture of iron and steel have enabled implement makers to introduce. Howard's "Simplex" plough (fig. 4, Plate III.), has almost a skeleton-like appearance; but from the principles adopted in its construction, the strength and rigidity are greatly increased. A very important feature in English ploughs is that they are fitted with cast-iron shares case-hardened on their under surface, the latter being thus rendered as hard as steel, while the upper part is soft and tenacious. The result is that while the upper part wears away the cutting edge always remains sharp; and the farmer daily recourse to the smithy, with its waste of time, and the inevitably irregular draught of the plough owing to such frequent alterations in setting the share, are all avoided.

Another great advantage in the different parts of a plough being cast, is that if any one fails or wears out, it can be instantly replaced by moving a few screws or bolts. This is a very great saving of time and expense; for before this, every time an accident happened to any part of the plough it took a long time to repair it, and the labour was meanwhile suspended, often at a very critical time of the year. There is another advantage in having the essential parts of cast iron. If any particular shape has been once discovered to be the best for any part, that shape is preserved without deviation in every plough made on the same pattern; and with respect to the turn-furrow this is of great importance.

Where the soil is light and crumbling, without stones, as in Norfolk, a single handle or stilt is sufficient; but where some force is occasionally required to prevent stones or other obstacles from turning the plough out of its course, two stils are most convenient, placed at a more obtuse angle with the sole of the plough.

The force required to draw a plough depends not only on the nature of the soil, but also on the shape of the plough, and especially on the position of its different parts with respect to each other, so that they do not counter-act each other.

Without entering into any comparison of ploughs differently constructed, it is evident that the shape of the plough must vary with the nature of the soil which it is to turn up. A light soil must be shovelled up; a mellow one may be turned over with any kind of mould-board; a very stiff tenacious soil, which adheres to any surface pressed against it, will be more easily turned over by a few points of contact which do not allow of adhesion. Hence the point and turn furrow have been made of all imaginable shapes, and while one man contends for a very concave form, another will admit of nothing which is not very convex. That plough will no doubt have the least draught which is best suited to the soil which it has to move. The lighter the plough is, consistently with sufficient strength, the less draught it requires, all other circumstances remaining the same. Lightness and strength combined are consequently great advantages; and if a very light plough does its work as well as a heavier, there can be no doubt that it is preferable. Durability is nothing compared with the saving of one horse in three: it is cheaper to have a new plough every year than to keep an additional horse all the year. If a wooden plough is found to be more easily moved than an iron one, there can be no doubt which should be preferred.

In ploughing land which is more or less mellow and crumbling, the great object is to bring to the surface that portion which has been buried, and has not served to nourish the preceding crop, and to bury that which has produced vegetation, and in which the roots of various weeds have established themselves. When manure is to be covered with a certain depth of earth, a more complete subversion is required, in order that no part of it may remain uncovered. When the land is in a compact state, from the roots which pervade it, and it is only ploughed once to prepare it for receiving the seed, much greater nicety is required to lay the slices at a certain angle so as to leave regular lines or depressions in which the seed may fall, and be readily raised by the furrows which follow. In this case the angle of 45° is found to be the most convenient at which the furrow slices may be laid against one another.

When the seed is to be drilled, the sward will be reversed by a single ploughing, it is necessary that the soil should be completely turned over and laid flat. To do this, and at the same time to bury all the grass, requires the furrows to be very equal and parallel; so that when a roller has gone over the land it is perfectly flat, without any interstices between the slices which are turned over. It requires a good ploughman to do this perfectly.

When clover-ley or old grass is ploughed up, it is difficult to bury all the grass which grows on the edge of the slice; and if it remains exposed it will grow and increase, to the detriment of the corn. To prevent this a wing is sometimes added to the side of the coulter, a few inches from the point. It cuts a small horizontal slice off the surface before the soil is turned over, and this falls into the bottom of the furrow and is buried there. The coulter with such a wing is called a *skin coulter*, because it, as it were, skins the surface. This instrument may require an additional horse to be put to the plough in tenacious soils, but this cannot be avoided. There is no doubt that no more horses should be put to a plough than can do the work; but whatever be the number required, there is no saving in doing the work imperfectly. The discussions about the number of horses which should draw a plough might easily be settled if the nature of the soil were

sufficiently taken into consideration. The shape of the plough may make some difference, but the tenacity of the soil makes a much greater.

In order to save hands and expedite the tillage of the land, ploughs have been contrived which make two or more furrows at once. At the commencement of the present century Lord Somerville took up the question of the importance of double ploughs under patent (see fig. 3, Plate II.), and wrote a book chiefly on the subject; and it is remarkable how closely his experiments accord with those since made as to the economy of horses and men, *i.e.* three horses do the work of four, &c. Large numbers of double and multiple ploughs are now made by the leading English firms. (See as an illustration, fig. 2, Plate III.) There is a great demand for them from foreign places where circumstances favour their use. In the United States of America gang ploughs, as multiple furrow ploughs are there termed, meet with the general approval of farmers.

Ploughs which break and stir the subsoil without bringing it to the surface, by following in the wake of the common plough, are now much used. Since the introduction of thorough draining it is found beneficial to loosen

the soil to a much greater depth than was formerly practicable, and this class of instruments is well fitted for the work. It is always advisable to use some such implement, and to mark and dig out the large stones encountered by it before introducing steam cultivation.

Broadshare or paring ploughs are much used in various parts of England in the autumn cleaning of stubble. A broad-cutting edge is made to penetrate the soil to the depth of 3 or 4 inches, so as to cut up the root-weeds which at that season lie for the most part near the surface. These, as well as the stubble, being thus detached from the firm soil, are removed by harrowing and raking; after which the land is worked by the common plough. The ordinary plough itself, stripped of its mould-board and fitted with a share 12 inches broad, is one of the cheapest and most efficient implements of this class. Various styles of ploughing are illustrated in fig. 4, Plate II.

Steam Cultivation.—The implements we have hitherto been describing are such as the farmer must continue to rely upon so long as he depends entirely upon the muscular force of animals as his motive power. But modern appliances have made the steam engine practically avail-



Fowler's System of Steam Ploughing.

able for this purpose. In the earliest stages of the invention it was proposed to move the engine itself over the land to be operated upon, but it soon became apparent that the best method was to communicate the power from the engine to the implements by means of steel wire-ropes and windlasses. There are still, however, two systems in operation by which steam power is applied to the purposes required—the first, or “roundabout” method, being popularly known as Messrs. Howard’s of Bedford; while the second, a “direct” system, was specially advocated by Messrs. Fowler of Leeds. It is to be observed, however, that the implements manufactured by these respective firms are by no means confined to one or the other principle. Messrs. Howard, for instance, turn out machinery on the “direct” principle, as well as on a third system by which two locomotives, working along opposite headlands, are used to draw a plough, cultivator, or other implement from one engine to the other alternately. (For an illustration of this, see fig. 1, Plate IV.) The expense is greater, and the system is only adapted, therefore, for large holdings.

In Fowler’s system of steam ploughing, as shown in the annexed engraving, the steam engine is placed on one

side of the field, and connected with an endless rope to an anchor on the opposite side. The plough is a framework of iron balanced upon two large wheels. To each side of this framework there are attached four plough bodies and coulters, so that four furrows are cut at one “bout.” The plough is drawn by the endless rope which proceeds from the engine and passes round the anchor; and as soon as the place at which the latter is fixed is reached, the end of the beam of the plough that was out of the ground is depressed (the other, of course, being raised), and the four ploughshares which were out of the ground, and which point in an opposite direction, are inserted in the soil and turn up the furrows on their way back to the engine. The engine and anchor have to be continually moved, but this is effected very rapidly and with little trouble. Of course, under ordinary circumstances, the expense of working one engine only is so much less than that of two as to compensate for any slight loss of time.

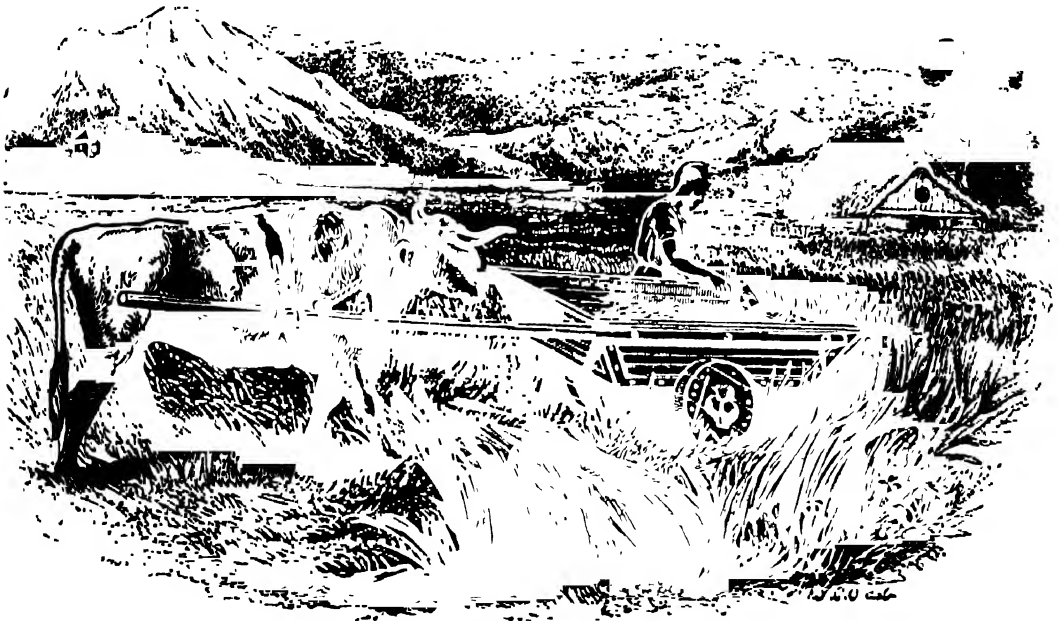
Grubbers, &c.—Next in importance to the plough are the instruments variously known as grubbers, cultivators, drags, or scarifiers. To prepare the soil for the crops of the husbandman it is necessary to pulverize it to a sufficient depth, and to rid it of weeds. Now, however excellent

in its own place, the plough is a cumbrous and tedious pulverizer, besides needlessly exposing a fresh surface at each operation, and cutting the weeds into minute portions which renders their removal more difficult. These defects were long felt, and suggested the desirableness of having some implement of intermediate character betwixt the plough and harrow, which should stir the soil deeply and expeditiously without reversing it, let in the air, and bring the weeds unbroken to the surface. To meet this demand large numbers of grubbers have been invented, the best known of which are Finlayson's Grubber, Biddle's Scarifier, the Ducie or Uley Cultivator, Tennant's Grubber, &c. All act on the same principle, viz., the disintegration and pulverizing of the soil by means of a number of curved prongs or "tines," the depth to which they penetrate being regulated by certain levers. Mr. William Smith, of Woolston, Bedfordshire, who may fairly be regarded as the pioneer of cultivation by steam power, warmly advocated the superiority of grubbing to ploughing, being of opinion that if the soil is thoroughly broken up to a sufficient depth, it is better not to reverse the surface, as weeds are thus kept on the top, and the

removal of them thereby greatly facilitated. His ordinary mode of working was to break up the ground by using a three-tined grubber, and then to go over it again with a seven-tined one, working at right angles to the first.

When a field has been broken up by the plough, or by the grubber, it is usually next operated upon by the *Harrow*, whether the object be to prepare it for or to cover in seeds, or to bring clods and roots to the surface. This is virtually a rake dragged by horses. In its most ordinary form the framework is of wood with iron tines, of which each harrow contains twenty. Various modifications of this, however, are made wholly of iron, the tines are much more numerous, and a more thorough and effectual abrasion of the surface is produced.

When clods have been brought to the surface, they are most effectively reduced by various kinds of *Rollers*. These formerly used were solid cylinders of timber or stone attached to a frame and shafts, for which hollow ones of smooth cast iron were then substituted; but upon this smooth roller several important variations have been introduced of late years—chiefly in making them fluted.



Roman 1

(As an illustration, see fig. 2, Plate IV.) The advantages claimed for these rollers are that by rolling land planted with wheat or other crops, the surface is levelled or smoothed, and stones and other obstacles to the use of the scythe or the reaping machine are removed. The consolidation of the soil effected tends to keep in the moisture and to check the growth of weeds; and the soil being compressed about the roots or seed, the plant thrives better. The ravages of the wire-worm and grub are also checked, and the crops are not so liable to be laid as upon unrolled land.

* One great advantage of steam ploughing is that steam does the work at the proper time. September, when the sun is at its hottest, and the land is at its driest, is the season for effectual tillage and destruction of weeds; and a steam cultivator will, on a light soil, break up 50 or more acres in a day. In the second place, steam executes heavy tillage more quickly and more cheaply than horses. A six-furrow plough in one bout turns up the same quantity of land as twelve horses; and as the speed is about double, it may be

calculated to turn over as much land per diem as twenty-four horses. The cost of ploughing 100 acres of medium land is estimated at £91 13s. by horses, and £62 by steam. Thirdly, fewer horses are required to a farm, the reduction varying from 10 to 25 per cent. Fourthly, by steam power only can thoroughly deep cultivation be secured. An immense area of this country has only been scratched, having never been ploughed beyond a depth of some 5 inches; but if we get the atmosphere down into a disintegrated subsoil—broken, say, to the depth of at least 1 foot—we largely increase the arable area of the land. Deep culture is, moreover, a powerful auxiliary to drainage.

In many parts of this country steam cultivation is rendered difficult, if not impossible, by the ground being wasted and encumbered with dividing hedges, ditches, banks, and trees. The removal of these would bring much more land under cultivation. Even if these obstacles, however, were removed, steam cultivation would still be out of the reach of comparatively small farms; and the only way to place the most effective apparatus within reach of the majority of farmers is by private companies

in different districts letting out steam-power implements to hire.

After *tilling* implements naturally come those used for *sowing*, *reaping*, and the harvesting and preparation of crops for the market. There is scarcely a single operation connected with these various processes for which inventive ingenuity has not provided a machine in substitution for the old forms of hand labour. On many of the farms of this country the comparatively small area to be operated upon scarcely justifies the expense of complete machinery, and this proves a very serious disadvantage, inasmuch as the larger farms can by means of machinery be worked at a very decided economy over the old ways. The difficulty may, however, be met to a great extent by co-operation in the purchase and use of the more expensive implements.

A very considerable portion of the grain annually sown in the United Kingdom is still (chiefly owing to the causes mentioned) distributed by hand from the primitive sowing chest.

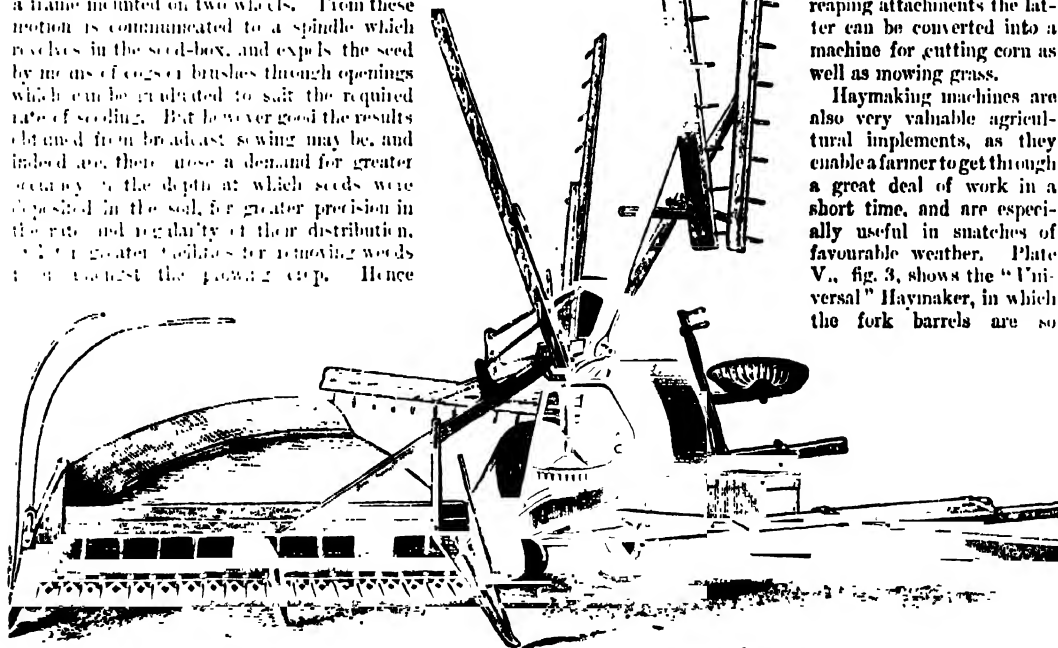
"The sower stalks
With measured step, and liberal throws the grain
Into the faithful bosom of the ground."

Where broadcast sowing is preferred, as is the case in many parts of Scotland, for instance, a machine may be used consisting of a long seed-box, carried on a frame mounted on two wheels. From these the motion is communicated to a spindle which revolves in the seed-box, and expels the seed by means of cog or brushes through openings which can be regulated to suit the required rate of sowing. But however good the results obtained from broadcast sowing may be, and indeed are, there is a demand for greater accuracy in the depth at which seeds were deposited in the soil, for greater precision in the rate and regularity of their distribution, and for greater facilities for removing weeds from amongst the growing crops. Hence

the invention of machines for sowing crops in rows or "drills," by which this initial operation and after-culture of the crops are now conducted with a precision reminding one of the processes of some well-arranged factory. Either corn, grass, clover, or turnips may be sown by these drilling machines, and with such undeviating straightness that horse-hoeing may safely be done, and that at far less expense than hand-hoeing and much more effectually. (See Plate IV., fig. 3.)

Mowers and reapers are amongst the most useful of those numerous labour-saving machines which have been invented or considerably developed for the use of the agriculturist during the last thirty years. Mowing machines were first used in America, but so great are their advantages that they are now kept even by small farmers, and mowing by the scythe is rapidly becoming quite a thing of the past. By employing a pair of horses and working them by relay, a machine can be kept at work sixteen hours a day in June or July, and can easily mow from 16 to 18 acres in that time. Plate V., fig. 1, is an illustration of Hornsby's "Paragon" Mower, and fig. 2 of Samuelson's Combined Mower and Reaper. With reaping attachments the latter can be converted into a machine for cutting corn as well as mowing grass.

Haymaking machines are also very valuable agricultural implements, as they enable a farmer to get through a great deal of work in a short time, and are especially useful in snatches of favourable weather. Plate V., fig. 3, shows the "Universal" Haymaker, in which the fork barrels are so



Howard's Simplex Reaper with Automatic Rakes.

arranged as to render clogging well-nigh impossible. The rakes are so mounted as to equalize the work, and to thoroughly separate and distribute the crop.

Machines for reaping are very ancient, as may be seen from the engraving on the previous page of a Roman reaper, which is mentioned by Pliny as early as A.D. 23. It was observed that this reaper was pushed by an ox, and cut the ears of the corn only, by a series of teeth thrust out in front of the cut, into which the ears fell. Up to 1851, however, practically the only implements for reaping purposes known in Great Britain were the reaper hook and scythe. In the Great Exhibition in

that year there were exhibited two reaping machines, known as McCormick's and Hussey's, from the United States, where for several years they had been used extensively and successfully. It appeared, however, that one, invented by Mr. Smith of Draxton in 1811, had already been used by that enterprising farmer with partial success; and that in 1826 the Rev. Patrick Bell, minister of the parish of Carnylie in Forfarshire, had invented a reaping machine for which a premium of £50 had been awarded him by the Highland Society; and further, that Mr. George Bell, a brother of the inventor, had for fourteen years successfully worked it on his farm of Inch-Michael in the Carso of

Gowrie. Four specimens of this machine had been carried to America, and from the identity in principle between them and those shown in the Great Exhibition, with other corroborating circumstances, there is little doubt that the so-called American inventions were, after all, only imitations of the Scottish machine. When, therefore, Bell's machine was made known by repeated public trials it received for a time considerable favour. Other makers, however, entered the field, and if, as was alleged, some of them obtained their first ideas from Bell's machine, they nevertheless so far improved upon it that the original was soon eclipsed. Burgess and Key's, with its Archimedean screw, is on the side-traction principle, the cutting arrangement being a serrated-edged knife with a reciprocating movement (see Plate VI., fig. 1). The standing corn is brought up to the face of the knife by a reel or fan revolving at slow speed, and when cut is received on large wooden rollers with deep metal spiral flanges which receive and deliver the cut corn at the side. Plate VI., fig. 2, represents Hornsby's Challenge Reaper, and the engraving on the previous page represents Howard's Simplex Reaper, which delivers sheaves of uniform size, whether the crop be heavy, or light, or irregular. The sheaves can be delivered by every rake, every second, third, or other rake in the set, and the changes are made by simply moving a lever without stopping the machine, or the necessity of removing or changing any gearing or parts. By the foot lever the rakes can be made to pass over the cut grain on the platform whilst turning at the corners, or when at work upon light or thin portions of a crop.

Some reapers have binder attachments, the binding being done with a string, and the sheaf neatly tied with a firm knot.

Next in importance to the introduction of steam ploughs and mowing and reaping machines into our fields, have been the improvements made in combined *thrashing machines*, the advantages of which were so apparent that they speedily superseded the old-fashioned flail. One of these is shown in Plate VI., fig. 3, and is so ingeniously arranged that the grain is not only thrashed and winnowed, but turned out in different samples fit for the market. The main features of all thrashing machines are those of the original inventor, the Scotch mechanist, Andrew Meikle. The unthrashed corn is fed evenly into a pair of slowly revolving fluted rollers of cast iron, by which it is presented to the action of a rapidly revolving cylinder or drum armed with four beaters, which are square spars of wood faced with iron, fixed parallel to its axis, and projecting about 4 inches from its circumference. The drum is provided with a dome or cover, and the corn being partly held by the fluted rollers as it passes betwixt the drum and its cover, the rapid strokes of the beaters detach the grain from the ears, and throw the straw forward upon slowly revolving rakes, in passing over which the loose grain is shaken out of the straw, and falls through a grating into the hopper of a winnowing and riddling machine, which rids it of dust and chaff, and separates the grain from the unthrashed ears and broken straw, called "roughs" and "shorts." The grain and roughs are discharged by separate spouts into the apartment below the thrashing loft, whence the corn is fed into the rollers, and the thrashed straw falls from the rakes into the straw barn beyond. Portable thrashing machines are very similar in principle, the chief difference being in their having six beaters, which revolve with great rapidity, generally about 800 times per minute. No feeding rollers are required, the unthrashed corn being introduced directly into the drum. Nearly all thrashing machines are now worked by fixed or portable steam engines. Thrashing machines of simple construction, with engines to burn straw as fuel, have been extensively introduced on the steppes of Russia and the

great plains of Hungary, where straw is over abundant and other fuel scarce, and where there are only unskilful peasants to work them. There is also every year an immense export of agricultural implements, of all kinds, to our various colonial possessions.

AGRICULTURAL LABOURERS. From the Anglo-Saxon period to the reign of Henry VII., nearly the entire population of England derived their subsistence immediately from the land. The great landowner consumed the produce of his demesne, which was cultivated partly by predial slaves and by the labour of the tenant and cottiers attached to the manor. These tenants were the occupiers of small farms, and paid their rent in kind or in services, or in both. The cottagers had each a small croft or parcel of land attached to his dwelling, and the right of turning out a cow, or pigs, or a few sheep, into the woods, commons, and wastes of the manor. While working upon the lord's demesne they generally received their food. The consolidation of small farms in the sixteenth century, and the altered social state of the country which took place at that period from a variety of causes, dis severed to a great extent the labouring classes from the soil which they cultivated. They had previously produced for their own consumption; and as domestic manufactures were common, each household possessed within itself the means of satisfying its principal wants. They now began more generally to work for money wages; and in vain did the legislature attempt to preserve them from dependence on this source of subsistence, by enacting penalties against building any cottage "without laying four acres of land thereto" (31 Eliz. c. 7). There were still, however, large tracts of waste and common lands on which the cottager could turn a cow, a pig, a few sheep, or geese, and this right still gave him a portion of subsistence directly from the land. The division and inclosure of these commons and wastes completed the process by which the labourer was thrown for his sole dependence on money wages.

So long as the labourer is paid fair wages, he can obtain the chief necessities of life; yet it happens that in most parts of the country he would be unable to procure any other description of vegetables, except potatoes, unless he had a garden attached to his cottage. No agricultural labourer's cottage should be without a garden where it is practicable. The necessity for cultivating the land on his own account, further than for the purpose of raising sufficient vegetables for his own consumption, and of looking to the allotment system as a means of remedying the evil of low wages and insufficient employment, is, in proportion to its urgency, an indication of the low position of the agricultural labourer. If he has sunk to this inferior state, and there are no other means of increasing his resources, the allotment system is then an expedient deserving of attention, and there is no doubt that it has proved successful in some places, and has been of great benefit to the labourer; but it should be understood that, in an economical sense, it is a more satisfactory state of things when the improvement in the condition of the labourer arises from the prosperity of the farmer, and his ability to give higher wages. The allotment system, if carried to considerable extent, involves the question of the advantage of very small farms as compared with large ones—a question that cannot be discussed satisfactorily without a consideration of the general economic condition of each particular country. But it may be laid down as a sure principle, that where a large part of the population are employed in other pursuits than those of agriculture, the necessary supply of agricultural produce cannot be raised so profitably in any way as by the well-instructed farmer who has sufficient capital to cultivate a large farm.

One of the principal differences between English and Continental husbandry is in the more minute divisions of the land in the case of the latter. It would appear, however, that very few indeed, if any, advantages arise to our Continental neighbours from this small-allotment system. The great ambition of an agricultural labourer abroad is to become a landowner; but when the Continental peasant has at length scraped together enough to buy one of the myriad farms in France, or of the 900,000 in Prussia, of some 2, 3, or 4 acres, he begins a life of incessant toil, living all the time worse than an English farm servant. The system may have the merit of giving an aim and an ambition to the labourer. But these advantages are bought very dear when a vast portion of the people are reduced to live in the dreary selfish parsimony which is the characteristic of peasant farmers. The labourer in the service of a capitalist able to make the utmost use of the soil is, on the contrary, likely to enjoy greater comfort and more comparative leisure than can be possessed by a peasant proprietor, all whose thoughts are immersed in the hope of saving a farthing here and a farthing there, and to whom comfort and leisure are at the most very distant and precarious prospects.

In a paper read before the Social Science Congress, Mr. James Caird pointed out that the French system of land tenure was by a small number of great landowners, and a large number of small owners who were also cultivators. Between them they comprised 5,550,000 persons engaged in the cultivation of the soil. There were in the United Kingdom 323,000 landowners of 1 acre and upwards, and 1,160,000 tenant farmers, making 1,483,000 persons altogether engaged in the ownership and cultivation of the soil, and interested in the maintenance of the present social system. But with five times the extent of land in wheat the French produced only twice the quantity, and with nearly double the extent of territory they had no more live stock than the farmers of Britain. On the essential question of the production of food and meat the superiority of our system was beyond dispute. The natural consequence of the French system was that the population did not increase. The 5,000,000 of peasant proprietors, with $7\frac{1}{2}$ acres each, and with a compulsory law of equal division among the families on the death of the owner, with no other industry must keep their numbers within the means of subsistence which their land afforded.

It seems exceedingly doubtful whether the Continental farmer, though blessed with a more genial climate and richer soil, is by any means ahead of his English rival, especially if tested by the productiveness of the soil, which should go very far to determine the question; and if circumstances have made the social arrangement of small holdings indispensable in France and other countries, it certainly has few characteristics which can tempt this country to envy or attempt to imitate it, and still fewer for agricultural labourers to desire it.

In consequence of a considerable and increasing emigration, and a strong current of migration from the agricultural districts to manufactures, workshops, pits, mines, the metropolis, and large towns, there is a rapidly-diminishing supply of agricultural labour in Great Britain. On the other hand, from the adoption of ploughing, reaping, threshing, and other machines, there is a diminishing demand for it.

AGRICULTURAL STATISTICS. Notwithstanding the acknowledged importance of exact information as to the amount of our agricultural production, it is only since 1867 that proper steps have been taken to insure a correct return of the expected amount of the incoming crop, and the state of live stock in the country. Such returns are now obtained annually by the inland revenue officers, who leave a blank form, stamped for free transmission by post, requesting the farmer to fill in the necessary particulars as to the state of his farm on the 4th of June. These returns are then made up for the different counties, and a summary of the general results published in the newspapers about the middle of August—so that the public are informed of the acreage of the principal crops, and of the number of live stock, before the harvest is concluded. The details for each county were not formerly issued till early in the following year; but since 1877 they have been published within about three months of the date of collection. In Scotland and Wales the information is most readily given, but in England there are a few occupiers who decline to furnish it, in which case an estimate is made by the officer from such information as he can derive from other sources. In Ireland the returns have been collected by the local police since 1852. In each county we give all the most interesting particulars relating to it, but for the sake of comparison we annex a table containing the latest particulars published with regard to the whole of the United Kingdom.

AREA, ABSTRACT OF ACHAGE UNDER CROPS, &c., AND NUMBER OF LIVE STOCK, IN EACH DIVISION OF THE UNITED KINGDOM IN 1881.

	England.	Wales.	Scotland.	Ireland.	United Kingdom (including Isle of Man and Channel Islands).
Total Area, Acres.	32,537,384	4,721,823	19,406,978	20,819,047	77,790,793
Total Acreage under Crops, Bare Fallow, and Grass, . .	21,844,490	2,800,569	4,811,813	15,242,837	47,840,977
Corn Crops,	6,645,139	463,651	1,375,040	1,569,823	10,113,261
Green Crops,	2,987,504	125,392	674,817	1,221,413	4,733,400
Clover, Sainfoin, and Grasses under Rotation,	2,544,865	310,157	1,526,442	1,962,730	6,392,402
Permanent Pasture or Grass not broken up in Rotation, .	12,197,566	1,899,235	1,207,019	10,846,808	25,667,200
Hay,	2,165	27	55	89,197	91,444
Hops,	60,258	—	—	—	60,258
Barren Fallow or Uncropped Arable Land,	684,953	24,108	27,540	23,560	773,542
Horses, as returned by Occupiers of Land, No.	1,083,633	139,941	187,893	480,848	1,904,515
Cattle,	4,451,658	660,879	1,136,004	4,112,287	10,422,763
Sheep,	16,424,064	2,056,097	6,963,293	3,243,572	29,876,787
Pigs,	2,267,441	217,387	160,560	1,306,195	3,963,205

AGRICULTURE, the art or practice of cultivating the ground, and, in its wide sense of husbandry, comprehending the raising of cattle and the provision of adequate pasturage, &c. It is the oldest and most important occupation of mankind, and the subject in its various bearings is so large that it is impossible, consistently with the plan of this work, to treat it exhaustively. Under the present heading, therefore, we propose briefly to refer only to some of the larger divisions of the subject, under (1) the historical and (2) the practical view.

In the oldest writings which have been handed down to us the common operations of husbandry are mentioned or alluded to, under the Greeks and Romans, in nearly the same terms in which we should describe them now. Considerable progress had been made in the tillage of the ground, and in the breeding and rearing of the domestic animals. The practice of fallowing land, to restore its fertility, can be clearly traced to them. The colonies planted by the Greeks and Romans tended to diffuse a knowledge of agriculture among the ruder nations.

The land in England consisted originally for the most part of woods, and of extensive pastures in which sheep and cattle were bred, which constituted the chief wealth. A very small proportion of the soil was cultivated; and while the population was thin there was no difficulty in obtaining land which had never before been broken up, and which with little trouble or manuring produced moderate crops of corn. When the husbandmen began to congregate in villages for mutual defence, the best land nearest to the habitations was cultivated, and the common pastures fed the cattle without much trouble or expense. Manure was seldom made; four times the seed was an average corn crop; and fields were fallowed every second year. Wheat was little cultivated; barley, rye, and oats were the principal produce. Many hogs were fed on acorns and beech-mast in the woods. Bread made of rye, barley, peas, or beans was the food of the labourers who were attached to the soil. The immediate tenants of the land cultivated a portion of the lands which they held for their own use, and let the remainder to smaller tenants, who, although born free, were little above the condition of the labourers, and lived much in the same manner. The live stock was frequently hired from the landlord. Oxen drew the ploughs; horses carried the produce to mill and market; and the implements were of the rudest kind.

The first English author of any note who wrote on agriculture was Sir Antony Fitzherbert, in 1523. The farmer of those days was a hard-working man. Money was seldom seen in his possession. He lived on the produce of his land, and fed his labourers at his own board. Wool was the principal article sold. The sheep were kept on extensive commons at little expense. The great difficulty was to keep them alive in severe winters, and many perished every year.

In the time of Elizabeth some attention began to be paid to the improvement of agriculture. The situation of the farmers appears to have improved. They began to acquire wealth and to increase their domestic comforts.

Cromwell encouraged agriculture; and works on this subject, published by Hartlib, Bligh, and Weston, introduced many improvements in the seventeenth century. From that time to the present day husbandry has improved slowly but regularly. With the increase of population, and consequent increased demand for the produce of the soil, the cultivation of waste lands, and the granting of long leases to farmers, were resorted to with the best results. Jethro Tull, a gentleman who had a property near Hungerford in Berkshire, introduced a mode of cultivation which was prevalent in Lombardy, and was borrowed from the practice of gardeners, who sow and plant their vegetables in rows with wide intervals. Find-

ing that in rich soils the produce was much increased by stirring the earth round the roots of plants, he formed a theory respecting the food of plants, which he imagined to be extremely attenuated earth. His theory was false; but the introduction of machines to drill the seed in rows, and of others to clean and hoe the intervals, which he principally suggested, has been of infinite use to the improved cultivation of the soil.

The rearing and fattening of cattle on the produce of arable land, which followed the introduction of sainfoin, lucerne, and other artificial grasses, and the cultivation of roots for the same purpose, have made a great change in the old systems. Manure is produced in greater quantity; the land is increased in productive power, and will bear more frequent crops of corn; better implements have been invented to save labour and do the work more completely; and good systems of drainage have been introduced. The improvements which have been made in the breeds of cattle and sheep may be considered as entirely modern.

To enumerate the various works which have come from the press on subjects connected with agriculture would be to give a catalogue of a large library. We can only mention some of the principal authors, such as Lord Kames, Marshall, Arthur Young, Sir John Sinclair, and Dickson. Of these the most original, perhaps, is the first; but the works of Arthur Young are those which afford the fullest information on the state of British husbandry in the latter part of the eighteenth century, and which did most towards its improvement. The *Farmer's Magazine*, which appeared in 1800, did much good in disseminating useful practices; and later journals, some issued by agricultural societies, such as the Royal, and Bath, and West of England, have continued to impart similar benefits.

Different systems of agriculture have been prevalent at different times and in different parts of Great Britain.

The first and most inartificial is that which consists in breaking up portions of pasture land, and sowing corn on a slight ploughing, which cannot fail to be productive for some time. Several crops may thus be taken, until the land is so exhausted that the crop no longer repays the seed and labour. To extend this time, experience soon pointed out the crops which succeeded best after each other. Wheat or barley were probably the first crops; afterwards peas, beans, or oats, until the ground, being overrun with weeds, would be left to the renovating effect of time, and a fresh spot would be broken up.

The first improvement on this system is that of infield and outfield. The infield is cultivated more carefully, somewhat like a garden, and all the dung of the cattle is exclusively put upon this part. The outfield is a continuation of the first-mentioned system. The infield consisted of inclosures or open fields near the dwelling, which it was most convenient to cultivate as arable land.

The mode of recruiting lands which had been exhausted by crops or were overrun with weeds, by means of a fallow, seems to have been introduced into England by the Romans, but appears not to have been practised in Scotland till the eighteenth century. The alternate crop and fallow seem to have been later introduced than a fallow after several crops. The triennial system, which consists of a summer fallow, a winter crop, and a spring crop, was probably longer established than any other, and is still the practice in many parts of England.

During the present century many of the old common fields in England have been inclosed and divided by special acts of Parliament; and where such has been the case, a better system of agriculture has generally followed. Clover and turnips are more regularly sown, and on the light lands take the place of summer fallow. Clover generally comes after a crop of corn, with which it was sown the preceding year in spring; and as most crops

succeeded well after clover, wheat was usually chosen for the next crop, as the most profitable. Thus arose the Norfolk (or alternate) system, without any very sudden departure from the old rotations. These changes, and the introduction of beans into the series, gave rise to the improved rotation of turnips, barley, clover, wheat, beans, wheat; after which the land is again cleaned and prepared for turnips with all the manure that can be spared.

As the English systems have taken their origin chiefly from the infield cultivation, so the Scotch appear to have arisen from that of the outfield. Fallows were unknown; but the sowing of grass seed gave rise to the Scotch convertible system of husbandry, which gained ground rapidly, and in remote situations, where no manure could be purchased, became firmly established. The convertible system is not very generally known or adopted in England, and is often confounded with the alternate system. The alternate system interposes a green crop between two white straw crops. On good land the convertible husbandry may consist of three or four years' tillage and three years' grass. Instead of sowing grass seeds after the land is exhausted, it has been found advantageous to accelerate the growth of grass by manuring the crop in which it is sown; and experience has proved that the richer the grass is the more productive are the crops which come after. The grass, instead of being a mere substitute for fallowing and manuring, is made highly profitable by feeding cattle and sheep; and the profit of the years when the land rests, as it were, by being depastured, is often as great as that of the years when it is cropped, and the risk and expense much less.

Several causes have contributed to a very great change which has taken place in the aspect of British agriculture since the commencement of the present century. By far the most potent of these causes has been the rapid increase of population. There were in Great Britain, at the census of 1881, nearly three times the number of people enumerated in 1801. Not only are there nearly three times the number of people requiring to be fed and clothed now that there were then, but from the increased wealth and altered habits of the people the individual rate of consumption is greater now than formerly. In the case of corn and meat, both of which are largely home produced, the imports prove the consumption per head to have enormously increased; and such an ever-growing demand for farm produce naturally stimulated agricultural improvement, in order to increase the productiveness of the soil. But the area of the country cannot be increased; and land—the raw material of the food producer—being thus limited in amount and increasing in demand, necessarily rose in price. It was impossible, however, for the farmer to recoup himself by adding to the price of his produce, for by the repeal of the corn laws agriculturists in distant countries were enabled to pour in the more cheaply-raised produce of land which had cost them little or nothing. The only resource of the British food-grower, therefore, was to adopt the best plans for increasing the cost of producing his crops and for increasing the amount. The average price of wheat in the five years preceding 1885 was 11s. 1d. per quarter, as against 16s. 6d. per quarter in the five years prior to 1815, though the cost of land is much higher now than it was then.

Before passing to the several conditions and processes of practical agriculture, it will be interesting to show, in a tabular form, the wonderful alteration that has taken place in agriculture in the present century, and more especially with respect to the marvellous increase in the imports of food since free trade was established. In the case of sugar and some other items, the articles, although products of the soil, could not have been cultivated in this country. The general fact, however, shown by the table remains, and it is, that British agriculturists, cultivating what is about the most expensive land in the world, have now the

exceedingly difficult task of competing with a food supply of practically illimitable extent, grown upon soils at once the cheapest and most productive that the earth affords. In spite of the expense of carriage half round the world, the farmers and stock-growers of America, Australia, and New Zealand have been able to place their produce in the British markets at prices less than those of home-grown articles. In the case of cattle, it is not many years since the import was actually prohibited, and other food products, such as corn, &c., were as far as possible excluded by heavy customs duties. Both the prohibition and the corn taxes have been abolished, and the country is now dependent upon foreign countries for considerably more than half its necessary supply of food.

SIR JAMES CAIRD'S TABLES OF COMPARATIVE AGRICULTURAL VALUES AND COMPARATIVE HARVESTS.

	1770.	1850.	1880.
Rent of land, . . . per acre	13s. ...	27s. ...	30s.
Price of bread, . . . per lb.	1½d. ...	1½d. ...	1½d.
" meat, . . . "	3½d. ...	5d. ...	9d.
" butter, . . . "	6d. ...	1s. ...	1s. 8d.
Wages of agricultural labourer, . . . per wk.	7s. 3d. ...	9s. 7d. ...	11s.
Rent of labourer's cottage, . . . "	8d. ...	1s. 5d. ...	2s.

Comparisons taken from the books of a Dairy Farm, situated between Lancaster and Garsington.

In 1770.	In 1850.
Rent, 21s. an acre.	Rent, 41s. an acre.
Rates, 3d. per pound.	Rates, 3s. 9d. per pound.
Tithes compounded for.	Tithes commuted, and included in rent.
1-7ths of farm in grass.	4-5ths of farm in grass.
3-7ths arable.	1-5th arable.
Annual produce of a cow, £1.	Annual produce of a cow, £9.
Six horses in a plough, and do an acre a day.	Two, and sometimes three, horses in a plough.
First man's wages, £9 a year, and his board.	First man's wages, £15 to £16 a year, and board.
Second man, £5 a year, and board.	Second man, £10 a year, and board.
Dairymaid, £3 and board.	Dairymaid, £7 10s., and board.
Bread (oat), 11 lb. for 1s.	Bread, 4d. per 4 lb. loaf, coarse wheaten bread; 5d. per 4 lb. best.
Cheese, 3d. per lb.	Cheese, 5d. per lb.
Butter, 8d. per lb.	Butter, 11d. to 1s. per lb.
Beef, 2½d. per lb.	Beef, 5d. to 6d.
Mutton, 2½d. per lb.	Mutton, 6d.
Labourer's house-rent, 20s.	Labourer's house-rent, 50s. to 100s.

Land Assessments.

	1857.	1875.	Increase Capitalized at 30 years' purchase.
England, . . .	41,177,000 ...	50,125,000 ...	268,440,000
Scotland, . . .	5,932,000 ...	7,493,000 ...	46,830,000
Ireland, fr. 1862, 8,747,000 ...		9,293,000 ...	16,380,000

Increase, £331,650,000

Estimated increase of farmer's capital during same period, through rise in values of live stock, 114,000,000

Total increase, £445,650,000

Aggregate capital employed by the farming class in the United Kingdom, £400,000,000

Produce of Wheat per Acre.

1849 ... 123	1861 ... 92
1850 ... 102	1862 ... 108
1851 ... 110	1863 ... 141
1852 ... 79	1864 ... 127
1853 ... 71	1865 ... 110
1854 ... 127	1866 ... 90
1855 ... 96	1867 ... 74
1856 ... 96	1868 ... 126
1857 ... 124	— 1038
1858 ... 116	1869 ... 102
— 1044	1870 ... 112
1859 ... 92	1871 ... 90
1860 ... 78	1872 ... 92

1873 ... 80
1874 ... 106
1875 ... 78
1876 ... 76
1877 ... 74
1878 ... 108
— 918
1879 ... 58
1880 ... 90
1881 ... 86
1882 ... 90
1883 ... 95
1884 ... 105

Estimated Wheat Harvests of the United Kingdom.

Year.	Acres	Character of the Yield	Assumed Bushels per Acre.	Available for Consumpt after Deducting Seed and Impure Qrs.
1866 ...	3,661,000	Under average	27	11,400,000
1867 ...	3,640,000	Much under	25	10,700,000
1868 ...	3,951,000	Much over	31	15,700,000
1869 ...	3,892,000	Under	27	12,800,000
1870 ...	3,773,000	Over	32	14,300,000
1871 ...	3,831,000	Under	27	11,570,000
1872 ...	3,810,000	Much under	23	10,110,000
1873 ...	3,670,000	Much under	25	10,500,000
1874 ...	3,843,000	Over	31	14,700,000
1875 ...	3,514,000	Much under	23	9,124,000
1876 ...	3,124,000	Under	27	9,065,000
1877 ...	3,321,000	Much under	22	9,432,000
1878 ...	3,382,000	Over	30	11,825,000
1879 ...	3,650,000	Very much under	18	5,600,000
1880 ...	3,070,000	Under	26	9,111,000
1881 ...	2,967,000	Under	27	9,124,000
1882 ...	3,164,000	Under	28	10,243,000
1883 ...	2,715,000	Under	26	8,124,000
1884 ...	2,751,000	Over	30	9,501,000
Average of 19 years	3,431,000	—	26½	10,606,000
Average of first nine years	3,798,000	—	28	12,278,000
Average of nine years 1861-1869	3,116,000	—	25½	9,184,000

The above table is based upon 28 bushels as an average crop and reckoning 28 bushels = 100. The figures of this and other tables are from Sir James Caird's valuable works on "The Landed Interest" and "English Agriculture."

From another authority—(*Times*)—the harvest estimates, being differently based, appear as follows:—

FOOD IMPORTED IN 1810 AND 1883.

	1840.		1883.	
	Quantity	Value.	Quantity	Value
Animals living, viz.—		£		£
Oxen, bulls, cows, and calves, No.	<i>prohibited.</i>	—	171,750	9,332,242
Sheep and lambs, "	<i>prohibited.</i>	—	1,116,115	2,518,382
Bacon and hams, cwt.	6,181	11,607	3,695,992	10,036,326
Beef, "	<i>prohibited.</i>	—	1,094,008	2,894,397
Butter and butterine, "	252,661	931,816	2,331,473	11,773,953
Cheese, "	226,462	124,616	1,799,704	4,890,400
Cocoa and chocolate, lb.	3,499,746	73,168	22,698,161	753,762
Coffee, cwt.	627,328	2,129,114	1,407,134	4,936,465
Corn—Wheat, "	8,637,993	5,880,480	61,138,631	31,454,481
" Other kinds, "	3,820,431	2,171,691	69,083,781	23,329,559
Flour—Wheat, &c., "	1,537,868	1,391,653	16,329,312	12,344,778
" Other kinds, "	—	—	1,211,116	493,549
Currants, "	221,119	589,651	1,026,581	1,123,062
Eggs, No.	96,119,160	220,312	910,136,160	2,732,055
Fish, cwt.	<i>prohibited.</i>	—	1,295,734	2,301,966
Lard, "	92	—	853,541	2,247,016
Meat—Salted, "	—	—	272,819	808,528
" Otherwise preserved, "	—	—	610,400	1,753,842
Oranges and lemons, bush.	<i>not specified.</i>	150,137	4,477,043	1,704,826
Pork—Salted, cwt.	29,532	58,818	376,899	761,871
Potatoes, "	2,293	516	5,119,509	1,585,260
Raisins, "	224,781	98,772	588,309	1,057,934
Rice, "	113,918	277,419	7,747,725	3,175,426
Sugar—Raw, "	4,035,815	9,053,770	20,366,627	20,473,237
" Refined and candy, "	17,388	25,809	3,283,920	4,168,617
" Molasses and juice, "	457,657	600,949	372,683	455,450
Ten, lb.	28,021,882	3,502,735	222,262,431	11,542,931
Total value.	—	27,599,173	Value in 1883,	170,950,295
			Value in 1840,	27,599,173
			Increase in 1883,	143,351,122

* The year 1883 is taken in preference to 1884, as owing to exceptional circumstances the latter year was not a fair average one.

Soils, and their relative adaptation for Agriculture.

--The soil being, as we have already observed, the raw material of the husbandman, its composition and capacity are to him considerations of the very highest importance; for unless due regard be had to them, successful agriculture is altogether impossible.

Soils may in general be said to consist of earthy metallic oxides, alkaline and saline substances, vegetable and animal matter, and water. Clay or alumina, silica or flint, in the form of sand, lime, and decaying vegetable matter or *humus*, are the principal among them.

The first approach towards a determination of the question, "Which soil is best fitted for a particular crop?" is made by analyzing existing fruitful soils; and this has been extensively practised since the application of chemistry to agriculture. The following are a few examples:—

A very rich soil near Drayton, Middlesex, consists of—

	Parts.
Carbonate of lime.	28
Silicious earth.	32
Alumina.	29
Animal and vegetable matter.	11
	100

This is a rich sandy loam, long and highly manured, fit for any kind of produce, and admirably fitted for fruit trees.

Another good turnip soil consists of—

	Parts.
Carbonate of lime.	63
Silica.	15
Alumina.	11
Oxide of Iron.	3
Vegetable and saline matter.	5
Water.	3
	100

This soil owes its fertility to the fine division of the carbonate of lime and the vegetable and saline matter.

The best loam in France consists of—

	Parts.
Fine silicious sand.	21
Coarse ditto.	25
Carbonate of lime.	37.5
Alumina.	16.5
	100

A loam at Chamart, highly prized by gardeners about Paris, as the basis of their artificial soils, consists of—

	Parts.
Argillaceous sand.	57
Finely divided clay.	33
Silicious sand.	7.4
Carbonate of lime, coarse.	1
Do., fine.	6
Woody fibre.	5
Humus and soluble matter.	5
	100

A very rich leath or bog earth found at Menden, and in great request for flowers and in composts, consists of—

	Parts.
Gritty silicious sand.	62
Vegetable fibres partly decomposed.	20
Humus.	16
Carbonate of lime.	8
Soluble matter.	1.2
	100

This soil, like our bog earth, would be very unfit for the growth of corn; but, from the quantity of humus and

vegetable matter, is highly useful in composts and artificial soils; mixed with lime, it would make an excellent top-dressing for moist clay soils.

An eminent German agriculturist has given a classification of soils of known qualities, worthy of notice. It is as follows:—

No.		Clay, per cent.	Sand, per cent.	Carb. of Lime, per cent.	Humus, per cent.	Value.
1	First class of strong wheat soils.	74	10	4½	11½	100
2		81	6	4	8½	98
3		79	10	4	6½	96
4		40	20	36	4	90
5	Rich light sand in natural grass.	14	49	10	27	?
6	Rich barley land.	20	67	3	10	78
7	Good wheat land.	58	36	2	4	77
8	Wheat land.	56	30	12	2	75
9	Do.,	60	38	2	2	70
10	Do.,	48	50	2	2	65
11	Do.,	68	30	2	2	60
12	Good barley land.	38	60	2	2	60
13	Do., second quality,	33	65	2	2	50
14	Do.,	23	70	2	2	40
15	Oat land.	23½	75	1½	1½	30
16	Do.,	18½	80	Very insignificant quantities.	1½	20

Below this are very poor rye-lands.

Few soils in England contain more than 4 or 5 per cent. of humus, even when in very good heart; and 2 per cent., with a good loamy texture, will render a soil fit for corn with judicious cultivation.

There are, however, various modes of distinguishing soils, without entering into a minute analysis of their component parts. The simplest and most natural is to compare their texture, the size and form of the visible particles of which they are composed, and to trace the probable source of their original formation from the minerals which are found around or below them, or the rocks from which they may have been slowly separated by the action of the elements. The science of geology, which teaches the relative position and nature of the minerals of which the outer crust of the earth is formed, is consequently of great utility in aiding us to compare different soils and in ascertaining their composition.

The soils which are immediately derived from the primitive rocks, consist either of visible fragments of quartz and other hard minerals, which are not affected by exposure to air or water, and are only ground and comminuted by being rubbed against each other in floods and torrents, or of minuter particles of the same, of which the shape is not readily distinguished by the naked eye. When they are altogether composed of visible particles and stones, the water readily passes through them; and unless they are kept continually moist by a regular irrigation, without any stagnation of the water, they are absolutely incapable of sustaining vegetation, or of bringing fruits to maturity. It is seldom, however, that any gravel or sand does not contain some portion of earth or other matter, of which the particles become invisible when diffused through water, and to which the expression *impalpable substance* may be applied. A certain portion of this finer part of the soil, and its due admixture with the coarser, especially where there is some regular gradation in size, and no stones of too large dimensions to obstruct the instruments of tillage, may be considered as *essential* to fertility. The chemical composition of the *impalpable substance* no doubt greatly affects the degree of fertility, but the general texture must be considered as by far the most important circumstance. To improve this texture permanently is the great object of all the labours of the husbandman. For this purpose he carries various earths from one spot to another; puts clay upon one field, and lime and chalk

upon another; brings peat to sands and clays, and carries gravel and lime to his peat-bogs. Without an adequate knowledge of the composition and texture of a soil it is impossible to make permanent improvements with any certainty, or without incurring the risk of failure or of useless outlay.

The soils which have been formed from the disintegration and decomposition of the primitive rocks, such as granite, basalt, slate, or limestone, and especially those which contain all these minerals minutely divided and intimately fixed, are always naturally fertile, and soon enriched by cultivation. The hard particles of quartz maintain a certain porosity in the soil, which allows air and moisture to circulate, while the alumina prevents its too rapid evaporation or filtration.

The soils which have been evidently formed from the rocks which are supposed to be of secondary formation, are fertile according to the proportion of the earths of these rocks which they contain.

Argillaceous earth, or clay, exists in some proportion in almost every rock. Some of the hardest gems are chiefly composed of alumina. It has the property, when mixed with other substances, as silica or lime, of fusing into a stone of great hardness and insolubility. In this state its effect on the soil is not to be distinguished from that of silica; and by burning common clay, or clay mixed with carbonate of lime, a sandy substance is produced resembling burnt brick, which tends greatly to improve the texture of those clays which contain little or no sand in their composition. It must be remembered that the stiffest clays contain a large portion of silica in an impalpable state; but this, instead of correcting their impermeable and plastic nature, rather adds to it. It is only palpal sand which, combined with clay in due proportion, and with a mixture of organic matter, forms the richest and most easily cultivated soil. Some of the rocks of secondary formation contain a considerable portion of alumina and lime; and when these earths meet with crystallized sand, a compound, or rather a mixture, is formed which has all the requisite qualities, as to texture, to produce the most fertile loams. The only deficiency is that of organic matter; but this is so readily accumulated wherever vegetation is established, or can be so easily added artificially, that these loams may always be looked upon as the most favourable soils for the usual agricultural operations; and if a considerable depth of loam is found, which neither retains water too long nor allows it to percolate too rapidly, it may be looked upon as a soil eminently capable of the highest degree of cultivation, and on which no judicious outlay of labour will ever cause loss or disappointment to the farmer.

The greensand which lies under the chalk, and appears near the surface in several parts of Britain, consists of silicious, argillaceous, and calcareous earth, intimately combined and in a high state of subdivision, and yet not forming a compact paste with water so as to dry in hard lumps, but having rather the loose appearance and granulation of fine sand, whence its name. On this soil are found the finest wheats; but such is the variety of its form as it approaches towards the chalk, or crystallized sand, or the plastic clay, that the soils which it forms have every degree of texture, from loose sands to stiff marls.

Chalk is perhaps the mineral most widely spread throughout Britain. See CHALK.

The Weald Clay consists of very minute particles of alumina and silica, forming a tough unctuous earth, fit for the growth of oaks, with very few stones or visible particles. This stubborn soil is found chiefly in Sussex and Kent. It may be rendered fertile by tillage, draining, and exposure to frost in winter; and its tenacity may be corrected by the application of lime, ashes, and other

substances, especially fresh stable dung, which interpose and prevent the clods from reuniting into one tough impervious mass. Lime and chalk do this most effectually; and when the weald clay has been brought to a looser texture it produces beans, wheat, oats, and clover in great perfection.

As clay soils predominate in England it is of great importance that it should be generally known that none repay the cost of improvement better than clays, provided the surface be such as to admit of perfect draining.

The Oxford Clay is of a bluish colour, which alters on exposure to the air. This is favourable to the growth of grass, and some of the richest pastures in Wiltshire and Oxfordshire have it for a subsoil. In the fens of Lincolnshire the Oxford clay is covered by a coat of peat, formed by the decomposition of aquatic plants, which have accumulated wherever the water had no natural exit. When these fens were laid dry by an extensive system of draining, the peat was converted into a rich soil by the admixture of the clay which was found under it.

The Oolite Formation contains much carbonate of lime cemented by an unctuous earth into a species of stone. The soil which lies over this stone, and which is of nearly the same nature, but broken and disintegrated, is various in its qualities. Sometimes it is of great fertility, and sometimes nearly barren, according as the impalpable matter in it abounds and contains a due proportion of the different earths; or it resembles a loose chalky sand, in which moisture is retained with difficulty. In the first instance it produces every kind of grain in abundance with moderate cultivation. In the latter it requires a great outlay of manure, which readily disappears, and it is justly called a poor hungry soil.

On the Red Sands, one is found a soil which is usually of the finest quality. The fine loose soils of Devonshire and Somersetshire are of this description. It imitates most of the requisites of a good soil in its texture, neither too close nor too loose, and in the impalpable matter in its composition. When it contains a proper portion of calcareous earth, it may be reckoned amongst the most fertile kinds; and where this is deficient, the addition of lime or chalk is the best means of improving it.

These are some of the principal natural soils found in Great Britain. Each distinct formation gives rise to a great variety with respect to fertility, even where the basis remains the same; but it is of great importance to the farmer to ascertain the general nature of the rocks and strata on which his farm is incumbent, and no chemical analysis can determine the exact value of the land, unless the geological situation of it is distinctly known. But with this guide the analysis may distinguish the varieties, and point out the spots which can be cultivated at the least expense, or improved by the simplest means; while it may also show the deficiencies which render a soil on the most favourable formations difficult of cultivation or improvement, when these deficiencies are not easily remedied for want of those substances which are not found within reach of the farm. In all these soils no notice has been taken of organic matter, because this seems not in any great degree to be connected with their formation. The Primary Strata are distinguished by having no traces of organic remains in their composition. The Secondary Strata have not a sufficient proportion to call for an especial notice of it. It is in the Tertiary Strata, especially those which have been formed by the destruction of animal and vegetable substances, that organic matter becomes a peculiar object of attention, and from this reason alone alluvial soils of later date are found highly fertile, whenever the circumstances which prevented their cultivation are removed; whether it be the waters which are to be shut out by dykes or carried off by draining, or a want of

labourers which has left them to a state of nature. When the soil is turned up and the seed sown, the crops are always, for a greater or less period, certain and abundant.

The alluvial soils formed by the deposit of a variety of earths in a state of great division, and mixed with a considerable portion of organic matter, form by far the most productive lands. They bear crop after crop with little or no additional manure, and with a very slight cultivation. These soils are found along the course of rivers which traverse extensive plains, and which have such a current as to keep very fine earth suspended by a gentle but constant agitation, but not sufficiently rapid to carry along with it coarse gravel or sand. Wherever there is an obstruction to the current and an eddy is formed, there the earth is deposited as mud, and gradually accumulating, forms these alluvial soils which are so remarkable for their fertility when carefully protected from the inroads of the waters. In these the impalpable matter greatly predominates; but the intimate mixture of the earths with organic matter, in that state in which it has been called *humus*, prevents their consolidating into a stiff clay, and the gases which are continually evolved from the organic matter keep the pores open, and give scope to the growth as well as the nourishment of the roots. It is in the alluvial soils principally that an accurate analysis is useful, because the proportion of their constituent parts varies in innumerable degrees.

Organic matter is no doubt essential to great fertility in a soil, but some soils require more of it than others. Humus, the form which organic matter naturally assumes by slow decomposition, in the earth, gives out certain elements which the roots can take up in their nascent state, and from which they obtain the carbon which is so abundant in all vegetable productions. But organic matter in every stage of its spontaneous decomposition keeps the pores of the soil open, and admits, if it does not even attract, air and moisture to the fibres of the roots. In all rich soils which have been long cultivated, especially in gardens, there are particles of a dark colour and fibrous texture, which in the microscope appear like minute logs of charred wood. These keep the soil open, and supply carbonic acid, when the air reaches them, or they are slowly transformed into humus, which remains inert as long as it cannot imbibe oxygen and form carbonic acid. Humus is no doubt one of the chief causes of fertility, but its presence does not appear to be so indispensable as has been imagined. A proper texture seems a much more responsible condition. Whether humus be formed directly or by the slow process of vegetation and subsequent decomposition, does not really appear; but it is certain that there are soils which are highly fertile in which scarcely a trace of it can be discovered. Such are those which are produced by the decomposition of the lava which has run in a liquid state from the craters of volcanoes. When exposed for a time to the influence of the atmosphere, the lava crumbles into an earth, which is neither so loose as silicious sand nor so plastic as clay, and it exhibits such a porosity as suits the growth of the roots of vegetables.

A good soil is composed of one-third coarse sand, one-third very fine sand, and one-third impalpable matter, in which there is silica in the greatest quantity, alumina and lime in smaller, and from 4 to 10 per cent. of organic matter, without any appearance of tannin.

The simplest process of ascertaining the mechanical texture of soils is by washing with pure water. For this purpose nothing is required but a few flat plates and large cups. Some of the soil is formed into a very thin mud by stirring it in a cup nearly full of water. The finer particles are successively poured off from the sand or grit, which at last remains pure, so that the water added to it is no longer discoloured. This being dried and weighed, gives

the coarse sand. The water and earth poured off are allowed to settle. A common soup-plate is found a very convenient vessel for this purpose. On the surface of the deposited earth will be found all the undecomposed vegetable matter, which with a little care is easily taken off, dried, and weighed. The finer portions of the earth can be poured off successively by shaking the whole moderately, till nothing but very fine sand remains. The alumina and impalpable silica will long stay in solution, and allow any sand yet remaining to be deposited. They may be rapidly separated from the water by filtration through stout blotting paper, but it is preferable to pour them into a glass tube about 1 inch in internal diameter, with a cork fitted in the lower end. In this tube the earths slowly fall to the bottom, and any variety in the size of the particles causes a line more or less distinct, which can be observed through the glass; and thus a very good idea may be obtained of the proportion of the different earths, as far as regards the size of their particles. In order to ascertain their chemical differences they should be taken to a chemist and analyzed.

The depth of the soil and the nature of the subsoil greatly affect its value. However rich it may be, if there is only a thin layer of good soil over a sharp gravel or a wet clay, it can never be very productive; in the first case, it will be parched in dry weather; and in the latter, converted into mud by every continued rain. If the subsoil be loam or chalk, 6 inches of good soil will be sufficient. With a foot of good soil, the subsoil is of little consequence, provided it be dry, and the water can find a ready outlet. The best alluvial soils are generally deep, the chalky shallow.

The exposure, with respect to the sun, and the declivity of the ground, are very important circumstances, and equivalent to an actual difference in the climate. A gentle declivity towards the south, and a shelter against cold winds, may make as great a difference as several degrees of latitude; and in comparing the value of similar lands in different climates, the average heat and moisture in each must be accurately known. A soil very fertile in the south of Europe may be very unproductive in England; and a light soil of some value in the west of Scotland might be absolutely barren in Italy or Spain.

Cultivation of the Soil.—The better the soil the less cultivation it requires to produce tolerable crops; hence, when the land is very rich, we find in general a slovenly culture; where the ground is less productive, more labour and skill are applied to compensate for the want of natural fertility. The simplest cultivation is that of the spade, the hoe, and the rake—and on a small scale it is the best; but spade husbandry cannot be carried to a great extent without employing more hands than can be spared from other occupations. The plough is the chief instrument of tillage, and has been so in all ages and nations of which we have any records. Hence, land chiefly cultivated by means of the plough is known as "arable" land (from the Latin *arare*, to plough). The main object of *ploughing* is to turn over the whole surface of the ground, as a preparation for bringing it to a finely pulverized state, and to admit the atmosphere to act upon parts before excluded from it. When grass land or stubble is ploughed, care must be taken to bury the grass and weeds completely, and the slice cut off by the plough must be turned over entirely, which is best done by making the width of the furrow greater than the depth. When the grass and weeds are rotten, and the ground is ploughed to pulverize it, a narrow deep furrow is best; the earth ploughed up is laid against the side of the preceding ridge, which forms a small furrow between the tops of the ridges, well adapted for the seed to lodge in and to be readily covered with the harrows.

Nothing has divided both practical and theoretical agriculturists more than the question whether the land should be ploughed deep or shallow; but a very slight attention to the purposes for which land is ploughed, and to the nature of the soil, will readily reconcile these apparently contradictory opinions. A deep, rich, and stiff soil can never be moved too much or too deep: deep ploughing brings up rich earth, admits the air and water readily, and gives room for the roots to shoot, whilst the rich compact soil affords moisture and nourishment. Whenever the soil below a certain depth is of an inferior quality, there can be no use in bringing it up; and where the soil is light and porous, the bottom had much better not be broken. Norfolk farmers know this well, and are very careful not to break the *pan*, as they call it, in their light lands. This *pan* is formed by the pressure of the sole of the plough and the tread of the horses, and opposes a useful bank to the too rapid filtration of the water. It lies from 5 to 8 inches below the surface. If it is broken the manure is washed down into the light subsoil, and the crop suffers, especially when sheep have been folded, their dung being very soluble. In such soils an artificial *pan* may be formed by the *land-presser* or *press-drill*. This instrument consists of two very heavy cast-iron wheels, with angular edges, set on an axle, at a distance from each other equal to the width of the furrows, and a lighter wheel to keep the instrument vertical. It is drawn by a horse immediately after the plough, pressing two furrows at once, and going twice over each furrow.

The mode in which the soil is prepared most perfectly for the reception of the seed is best shown by following the usual operations on fallows. After the harvest, the plough is set to work, and the stubble ploughed in. The winter's frost and snow mellow it, while the stubble and weeds rot below. In spring, as soon as the weather permits, it is ploughed again, the first ridges being turned over as they were before. This completes the decomposition of the roots and weeds. It is then stirred with harrows, or other instruments, which tear up the roots that remained, and some of these, not being easily destroyed, are carefully gathered and burned, or put in a heap to ferment and rot, a portion of quicklime being added. Another ploughing and stirring follows, at some interval, till the whole ground is mellow, pulverized, and free from weeds; manure is put on, if required, and immediately spread and ploughed in. The land is then prepared for the seed.

Various instruments have been invented to stir the earth and mix it, without so often using the plough, and also to loosen and separate roots and weeds. They are nearly all made on the principle of the harrow, and consist of a series of spikes or teeth, to break up the clods of earth. When the soil turned up by the plough is in large hard lumps, a roller, sometimes with spikes in it, is drawn over the land to break the clods, or mallets are used to break them by hand; but this is seldom necessary except where very stiff soils have been ploughed when too wet, and the ridges have dried and been ploughed again in dry weather.

The influence of the atmosphere on the soil, and the increased fertility produced by pulverizing and stirring heavy lands, led to the notion adopted by Jethro Tull, that labour might entirely supersede the necessity of manure. Hence the origin of the horse-hoeing husbandry, which at one time was so highly thought of as to be called, by way of distinction, "the new husbandry." Fallows and manuring were both discarded as unnecessary; the seed was sown in rows with wide intervals, which were continually kept worked and stirred. At first the result was highly satisfactory; all the humus, by exposure to the air, was converted into soluble extract, and taken up by the plants, which thrive well as long as the supply lasted; but in the

end it was exhausted, and the system has gone out of favour.

In describing the various processes in general use in the cultivation of the soil, we have taken the year when the land is fallowed, because it is then that it receives the most perfect culture, which enables it to produce several crops afterwards with a much smaller quantity of labour. By such fallowing and proper manuring, the soil is fully restored to its highest degree of fertility. In light soils, which are generally poorer, turnips or other green crops are sown, on which sheep are folded, which by their manure still more enrich the soil, and it is only when this manure is ploughed in that the land may be considered as possessing the proper degree of fertility.

Sowing.—When the land has been duly prepared, the seed is sown. This is done sometimes before the last ploughing, but then the manure should have been ploughed in before; for, except in planting potatoes, which are not a seed but a bulb, the manure should always be deeper, and not in contact with the seed. When the seed is ploughed in, the furrow should not be above 2 or 3 inches deep, and 8 or 9 wide; and it is only in particular soils that this mode is to be recommended. The most common method is to sow the seed on the land after the last ploughing, and draw the harrows over to cover it. When the land has been well ploughed, and especially if the press-drill has followed the plough, the seed will mostly fall in the small furrows made by two adjoining ridges, and rise in regular rows.

Much of the success of the future crops depends on the time and the mode in which the seed is committed to the earth. After the land has been well prepared by judicious tillage and manuring, many accidents and circumstances may disappoint the hope of the farmer, and the crop may be scanty or fail altogether. The weather and the seasons are not under his control; but still much depends on his own judgment and skill. If he selects the best seeds, chooses the proper season for sowing them, and has them carefully distributed and properly covered with earth, as their nature requires for the most perfect germination, and thus also protects them from the voracity of birds and insects, he will have a much greater prospect of success, under all circumstances, than if he were careless or negligent.

The most common mode of sowing the seed is by scattering it as evenly as possible over the ploughed surface as it lies in ridges from the plough. The harrows follow, and crumbling down the ridges, cover the seed which has fallen in the hollows between them. It requires an experienced sower to scatter the exact quantity over a given surface, without crowding the seed in one spot and allowing too great intervals in another. Hence the farmer who does not himself sow the seed, invariably chooses the most experienced and skilful labourer to perform this work. Notwithstanding every care and attention the seed cannot always be sown with perfect regularity, and it is this difficulty that has stimulated the invention of machines for sowing, which are noticed in the article on AGRICULTURAL IMPLEMENTS.

Drilling is a mode of sowing by which the seed is deposited in regular equidistant rows, at such a depth as each kind requires for its most perfect vegetation. It has been practised by gardeners from time immemorial, and from the garden it has gradually extended to the field. Though it has not realized the over-sanguine expectations of some agriculturists, the advantage of sowing the seeds in rows or drills has stood the test of experience; and the drill husbandry, by combining the advantages of continued tillage with those of manure and a judicious rotation of crops, is a decided improvement on the old methods of sowing all seeds broadcast. The crops which are now

most generally drilled are potatoes, turnips, beans, peas, beet-root, cole-seed, and carrots; and in general all plants which require room to spread, whether above or under the ground. The distance between the rows in these crops is generally such as to allow the use of a light plough or horse-hoe to be drawn by a horse between them. The most common distance is 27 inches. The Northumberland mode of cultivating turnips, which is adopted by most scientific farmers, consists in placing the manure in rows immediately under the line in which the seed is to be drilled, and keeping the intervals in a mellow and pulverized state by repeated stirring.

The instrument used for sowing seeds in single rows is sometimes a small light wheel-barrow, which a man pushes before him; hence called the drill-barrow. It has a box in which the seed is put, with a slide to regulate the quantity. This is allowed to fall on a wooden or metal cylinder below.

The proper season for sowing each kind of grain, the choice of seed, and other particulars, are explained under the name of the different seeds usually sown. As a general rule, it may be observed that the smaller the seed the less it must be covered; and clover or grass seed are not usually harrowed in, but only pressed in with the roller.

It has been found by experience that besides the general exhaustion of humus produced by vegetation, especially by those plants which bear oily or farinaceous seeds, each kind of crop has a specific effect on the soil, so that no care or manure can make the same ground produce equal crops of the same kind of grain for any length of time without the intervention of other crops. Whether this is owing to any peculiar nourishment necessary to each particular kind of plants, or because plants not indigenous deteriorate in a foreign soil, the fact is certain with respect to most crops usually raised, and particularly red clover. This points out the advantage of varying the crops according as they are found to succeed best after each other. In general, all kinds of grain succeed best after a crop which has been cut before the seed has ripened or the stem is dried up. Those plants which have a naked stem with few leaves thrive best after leguminous plants, which have more succulent stems and more leaves, and which bear their seeds in pods, as peas, beans, tares, or vetches; or after esculent roots, which strike deep into the ground, as carrots, parsnips, beet-roots, and turnips. From these circumstances the different systems of *rotation* have had their origin.

Reaping (or cutting corn when it is ripe) is one of the most important operations of harvest. It requires many hands to accomplish it in proper time, so that the corn which is ready for the sickle may not be too ripe and shed, and the fair weather be allowed to pass before all the corn is secured in barns or stacks.

The common reaping-hook, or sickle, with which in some places the corn is stalked out, is one of the oldest instruments of husbandry, and the goddess Ceres was generally represented by the ancients with a sheaf of corn and a sickle in her hand. The division of labour is introduced with advantage amongst a band of reapers. A certain number cut the corn, while others follow to gather the sheaves; some only preparing the bands, and others tying them and setting up the sheaves into stacks or shocks, which usually consist of ten or twelve sheaves. In many places there is a regular measure for the circumference of a sheaf, which should never exceed 30 inches. The bands are made by taking two small handfuls of the cut corn, and crossing them just below the ears into a knot. The sheaves should be so tied that there may be no danger of their falling loose when pitched into the cart or stacked, without being so tight as to prevent the moisture in the straw from evaporating. They should not be tied too near the ears,

but rather nearer to the butt. When tied they are placed two and two on the butt-ends, with the ears leaning against each other; but sometimes in a circle, all the ears being together, and the butts slanting outwards: a sheaf is then opened, by inserting the hand into the middle of the ears, and reversed over the tops of the preceding, forming a cone, and covering all the other ears, while it hangs down around them. In this position they will bear much rain without injury.

Very generally oats and barley are cut with an ordinary scythe, and treated in some counties in a similar manner to hay. The process of reaping with the sickle or scythe is tedious and expensive; hence machinery has been introduced for the purpose, and bids fair entirely to supersede the old methods. During the last half-century numerous patents have been taken out for reaping machines, both in England and the United States. Some of these are already described in the article on AGRICULTURAL IMPLEMENTS.

Another department of agriculture is that which concerns *Pasturage and Grass Land*.—The *pasturage* (Latin, *pastura*, a feeding ground) of cattle has of late years become of greatly increased importance as a regular part of husbandry, in consequence of immensely increased consumption of butcher's meat by all classes of the community.

Pastures are now fenced and protected, and pains are taken to improve them, so as to maintain many more cattle or sheep than they would in their natural state. We do not refer to rich grass lands, in which bullocks and sheep are fattened, and which are commonly called grazing land; nor to artificial pastures, which form portions of arable farms, and have been depastured only to enrich them and make them more fit to produce corn when again submitted to the plough; but to those tracts of land which, from situation, climate, or other causes, although they are portions of certain estates and the property of individuals, lie nearly in a state of nature, and produce a revenue or profit only according to the number of cattle and sheep which can be reared or maintained in them. There are many such pastures on the Jura, the Alps, and the Pyrenees, too high and exposed to allow of cultivation or permanent habitation, but producing abundant food for cattle in particular seasons of the year.

Whenever pastures are hired, the rent is always reckoned, not by the extent of surface, but by the stock which can be maintained upon it. Thus in Switzerland, the mountain pastures are divided into portions of twenty, forty, or more cows. In many places pasturing has been found much more productive than cultivation; and some large proprietors have converted great tracts of land from arable into pasture farm. But this can only be done where the population is very scanty, and where the soil and climate do not tempt men of capital to settle.

Wherever there are large pastures in exposed situations, proper and suitable buildings made of substantial materials should be erected. The cattle should have numerous sheds for refuge in bad weather, and sheep especially should have protection and shelter. Warmth is in some cases of more importance than food; and an animal exposed to all the severities of a northern climate requires more food to keep it alive than when kept warm and protected from the immediate influence of cutting winds.

There is another kind of pasture in England, on the chalky hills which are called Downes, where useful and hardy sheep are reared. Here the exposure is less, and the proximity to the plains gives frequent opportunity of driving the sheep to sheltered situations. The grass on the chalk hills is in general very fine and short, and the quality is very good.

Pastures are seldom improved with manure, which is generally reserved for arable land, or grass land intended to be mown for hay; but if richness is valuable in a pas-

ture, it will well repay the expense of manuring, especially with liquid manure, the drainings of dunghills and the urine of cows and horses, which is collected in a tank when they are kept in stalls. Peat ashes are also very useful, and have a powerful effect in stimulating the vegetation of all the grasses. The adaptation of the stock to the nature of the pasture is an object of the greatest importance, and requires much judgment and experience.

Grass Land proper may be divided into upland pastures and artificial grasses. Upland pastures are portions of land on which the natural grasses grow spontaneously, varying in quantity and quality with the soil and situation. When a pasture land is naturally rich, the only care required is to stock it judiciously, to move the cattle frequently from one spot to another, and to eradicate certain plants which are useless or noxious. The urine of the cattle is the manure which keeps up the fertility of grass land. A poor arid soil is not fitted for grass, nor one which is too wet from the abundance of springs and the want of outlet for the water. These defects can only be remedied by expensive improvements.

When old meadows have been neglected, or too often mown, they produce nothing but a coarse sour grass. In that case, besides draining it if required, the land must be broken up and undergo a regular course of tillage, until the whole of the old sward is destroyed. The proper method of treating such land is to sow no more corn crops than will pay the expense of breaking up, carting earth, lime, or other substances upon it, to improve the soil, and to lay it down to grass again as soon as the old sward is destroyed.

If the soil is fit for turnips, no better crop can be sown to prepare for the grass seeds. Turnips of an early kind may be sown in May, and fed off with sheep in August or September; and the ground being only very slightly ploughed, or rather scarified, and harrowed fine, the seeds may be sown and rolled in. The species of grasses sown must depend on the nature of the soil, but it is impossible to be too choice in the selection. The quantity per acre of the mixed seeds should not be less than 30 or 40 lbs., to insure a close pile the next year. If the soil is not naturally rich, liquid manure should be used. Sometimes, in soils not congenial, recourse is had to inoculating grass. This is done by taking pieces of sward from an old meadow, and spreading them over the surface of the land to be laid down, after it has been ploughed and prepared. This is a very effectual method of producing a permanent pasture.

When an arable field is sown with the seeds of grasses and other plants which give herbage for cattle, it is called an artificial meadow. Clover in this case is always a principal plant, both the red and the white; these, with annual or perennial rye grass, are sown with a crop of corn in spring, and begin to show themselves before harvest. The seeds usually sown on an acre, when the land is laid down to grass, are as follows:—Red clover, 12 lbs.; white, 6 lbs.; trefoil, 4 lbs.; rib grass, 2 lbs.; and 2 pecks of Pacey's rye grass. Sometimes cockfoot grass (*Dactylis glomerata*) and cow grass (*Trifolium medium*) are added. This is for a field intended to remain four or five years in grass.

"Haymaking" in variable and wet seasons is extremely difficult on the old plan of waiting until the grass has thoroughly dried on the ground after cutting. By the ingenious invention, however, of Mr. W. A. Gibbs, known as the "hay-dryer" and the "stack-cooler," farmers are rendered independent of the weather, as they may make their hay in the wettest season and stack it at once without any danger. See HAY.

The introduction of artificial meadows in districts where the soil seemed not well adapted for pasture has greatly increased the number of cattle and sheep reared and fattened, and has caused greater attention to be paid to the means of improving the breeds of both.

In the neighbourhood of large towns there are many meadows, which, without being irrigated, are mown every year, and only fed between hay harvest and the next spring. These require frequent manuring to keep them in heart, and with this assistance they produce great crops of hay every year. The grazing of cattle is generally considered a more profitable occupation than simply tilling the land; though the capital required is considerable, yet the current expenses are not great. By uniting the raising of corn and the grazing of cattle and sheep the largest profit is probably obtained, and this is the great argument in favour of the convertible system of husbandry.

The Farm.—A farm is a certain portion of land appropriated for cultivation either by the proprietor or by a tenant, who pays for it a certain stipulated rent. In the present improved state of agriculture, a man who takes a farm of 200 acres of arable land, or land partly arable and partly good pasture, will require from £1600 to £2000; and it is not advantageous either to landlord or tenant that he should take the farm unless he can command that sum. The amount of capital required depends in a great degree also on the quality of the land; very rich land requires less capital in proportion to the rent than poor land.

When it is ascertained what extent of farm may be safely undertaken with a given capital, the most important object to be attended to is the condition and fertility of the soil, not only with respect to the natural quality of the land, but the actual state it is left in by the preceding system of cultivation. It will be a great advantage to have had an opportunity of seeing the land at all times, observing it in different seasons and states of the weather, and especially of seeing the crops thrashed out, and ascertaining the quantity of corn. Much is usually yielded from a certain quantity of straw; for lands very similar in outward appearance will produce a very different return when the crops are thrashed out. Next to the nature of the soil is to be considered the convenient situation of the farm, the disposition of the fields, and the adaptation of the farm-buildings to the most profitable occupation of the land. The roads, especially those which lead to the neighbouring towns, whence manure may be obtained, are a most important object; and if there is water-carriage it greatly enhances the value of the farm. The roads to the fields, and the distance from these to the farm-yard; the convenience of having good pasture, or land easily laid down in grass near the homestead; and especially the situation of the farm buildings with respect to the land, and the abundance of good water—are all circumstances which must be well considered, and which will greatly influence the probable profits, and consequently the rent which may be fairly offered.

The disposition of the buildings is of great importance. Large straggling buildings are inconvenient, and cost much in repairs. The house should be neat and comfortable, fit for the residence of a farmer who has a capital such as the farm requires. Near the house and the farm-yard there should be a small paved court separated from the yard by a low wall. In this court, which should communicate with the dairy, the utensils may be placed on proper benches to air and dry in the sun. The yard or yards in a large farm should be sheltered on the north side by the barns, which need not be so extensive as used formerly to be thought necessary. Every farm which is so extensive as to require more than one floor to thrash the corn on, ought always to have a thrashing machine attached to it. A small yard, distinct from the other, with sheds for the cattle to shelter themselves under in wet and stormy weather, is a great advantage. The cart-sheds should be in the stack-yard, which properly occupies a space north of the barn. There should be a sufficient number of stauls, with proper pillars and frames to build stacks on. On each side of the yard should be placed the stables, cow-houses,

and feeding-stalls, with a pump of good water near the last, and convenient places to put hay, straw, and turnips in, with a machine to cut them. An underground cistern near the cow-house and stables, into which the urine and washings of the cow-house may run by means of a sink or drain, is a most useful appendage. The liquid manure thus collected in a tank will be found most useful in enriching the land. Light thatched roofs are sufficient for the sheds and smaller buildings, and even for the cow-houses and stables. The house should always be detached from the farm-buildings, and should have a tiled or slated roof.

A *barn* is the farm building in which agricultural produce is stored, to protect it from the weather and keep it in safety. Such buildings are needed in all countries where the climate does not permit the corn to be thrashed in the field and immediately put into a granary; and they were formerly large enough to contain the whole produce of a farm, whether hay, corn, or straw. Owing to the improved practice of stacking hay and corn in the open air, modern barns are much smaller.

Barns are built of stone, brick, timber, or in some places of dry rammed earth in the manner termed *pieci*. If roofed with tiles they should be bedded in coarse hay, which is more effectual than mortar in preventing the drifting of snow; and if with thatch, reeds are to be preferred to any other material, because they afford no lodgment for vermin, and afford an excellent protection against the weather.

Drainings, in rural economy, is a term applied to the flowing of excrementitious liquids into the common dung-heap of the farm-yard. The application of drainings to compost heaps is now extensively practised both by scientific and practical farmers, and those who neglect this provision sustain material loss by being driven to make extensive purchases of manure, both at home and abroad. It should be remembered, however, that the farmer who buys guano, bone-dust, or other artificial manures, but does not look carefully after his drainings, is extravagant; for he brings the same thing into his yard at great cost, when he might have for nothing, if he did not suffer it to flow or evaporate uselessly away from the same. That drainings fertilize the soil, every farmer must be aware even from childhood; but how great is their power in this respect, and how much of this power may be lost by careless preservation and treatment, many farmers do not yet know. Were it otherwise, draining tanks, conveniently placed, would be provided in every farm-yard; one would no longer find on a farm great puddles of drainings, or how great amounts of liquid guano steaming forth from every farm enclosure, to be lost in the village pond.

The great manuring value of drainings arises principally from the quantity of nitrogen and potash contained therein. We find that in the twelve months' drainings of a cow there exists as much of nitrogen as is to be found in 5 cwt. of the best guano, and of potash, about 1½ cwt. Moreover, if these twelve months' drainings were collected and dried, it has been computed that about 6 cwt. of solid extract might be obtained from them, which in fertilizing power would be equal to the best South American guano.

In the collecting of compost heaps, and the application of manures, all the refuse matters connected with a farm may be profitably made use of, such as scrap-suds, dish-water, blood, ashes, soot, peat-dust, saw-dust, rubbish, sweepings of mud, dirt, &c. These heaps may be kept most rich drainings, the ammoniacal combinations in which are retained, partly by the earth, and partly in the humus. The process of fermentation is materially accelerated by occasionally stirring up the mass. Thus the farmer is able to secure considerable advantages, from the employment of what would be nuisances on his farmstead.

The subject of MANURES in general, and also that of DRAINAGE, will be treated of in separate articles.

AGRIGENTUM, now **GIRGENTI**, a Sicilian city, distinguished by the magnificence and gigantic size of its ruins, which bear evident testimony that the stories related of its extraordinary wealth in old times are not entirely without foundation. It was called by the Greeks Akragas, and by the Romans Agrigentum. It is situated on the southern coast of Sicily, about 2½ miles from the sea, 37° 17' N. lat., 13° 28' E. lon. It was a colony from Gela, another city lying on the same coast, to the eastward, founded about B.C. 580, and was at first a free city, then under the government of a single person or *tyrant* (a Greek word merely expressing the assumption of absolute power), of whom the celebrated Phalaris was one. In union with Syracuse Agrigentum resisted the Carthaginians, and defeated them at Himera. We find few notices of it again till B.C. 408. At that time the city flourished, according to Diodorus, in wealth and luxury, such as no other state except Rome itself ever exhibited. The celebrated temples of Hera and of Concord are amongst the purest models for the earlier style of Doric. The massive columns of the first-named lose a third of their diameter from bottom to top. (The later Doric is more slender, and more elegant.) Columns and entablatures of these fine works will be found in our Plates on GREEK ARCHITECTURE. The temple of Zeus also is a grand ruin, and the remains of the ancient city generally are imposing. The number of citizens is stated by Diodorus (xiii.) at 20,000, and of foreigners settled there 180,000 more, a number probably much exaggerated. In B.C. 405 this prosperous city was again attacked and captured by the Carthaginians, its inhabitants dispersed, and the city razed. From this destruction Agrigentum never recovered. See **GIRGENTI**.

AGRIMONY (*Agrimonia*) is a genus of yellow-flowered plants belonging to the order ROSACEÆ. It is distinguished in the order by having the two or three carpels inclosed in the dry tube of the five-cleft calyx, by the hooked bristles outside the calyx, by the five petals, and numerous stamens. There are two British species, *Agrimonia Eupatoria* and *Agrimonia odorata*. The latter is rare, and may be known by the hooked bristles bending downwards instead of spreading out. The common agrimony is a wayside plant, about 2 feet high, with a spike of yellow flowers. It is a tonic and an astrigent, and is found as an ingredient in several "herb teas." It also contains tannin, and is sometimes used to dye wool of a nankeen colour.

Hemp agrimony is *Eupatorium cannabinum*.

AGRIPPA, H. CORNELIUS, a celebrated writer, philosopher, and physician, who flourished during the sixteenth century, was born at Cologne of an ancient family, 1486. When very young he fought as a private in the Italian wars of the Emperor Maximilian, and received the honour of knighthood on account of his courage. He then turned his attention to study, obtained the degrees of Doctor of Laws and Doctor of Medicine, and in 1509 was appointed lecturer on theology at Dole. Here he directed some severe satires against the monkish orders, and aroused their hostility to such an extent that they followed him with hatred and persecution to the end of his life. Compelled to leave Dole, to escape arrest on the charge of heresy, he spent a short time in England, and subsequently taught theology at Cologne, Pavia, and Turin. He afterwards went to Metz, where he was appointed to the office of syndic; but as he still maintained his controversy with the monks, and successfully defended a poor woman who had been accused of witchcraft, he was obliged to leave that city. He returned again, however, in 1524, and having gained considerable fame as a physician he was appointed medical attendant to the queen-mother of Francis I. Before he had any opportunity of attending upon her he received orders to consult

the stars as to the issue of the campaign about to be undertaken by Francis in Italy. This he declined to do, and thus lost the royal favour, from which he had hoped so much. He then proceeded to Holland, where he composed his most celebrated work, entitled "De Incertitudine et Vanitate Scientiarum," which was afterwards published at Antwerp in 1530. It was a satire of extreme severity upon the existing state of learning, or rather upon its scholastic professors and directors. He had previously published a work on the "Excellence of Women," by which he gained the favour of Margaret of Austria and the post of historiographer to the Emperor Charles V. He published a history of a portion of that monarch's government, but being accused of blasphemy and irreligion his salary was stopped, and he was imprisoned at Brussels in the year 1531. On his liberation he visited the Archbishop of Cologne, to whom he dedicated his "Occult Philosophy." His debts drove him from that city, and his book was attacked by the Inquisition. He afterwards lived at Bonn until 1535, when he repaired to Lyons. Here he was imprisoned for a libel against the mother of Francis I., but obtained his release through the good offices of his friends, and retired to Grenoble, where he died the same year. His works were published in two vols. 8vo, at Lyons, about the year 1550, and have been several times reprinted. He possessed considerable literary and scientific attainments, but he appears to have dabbled a little in alchemy and astrology, and this, with the publication of the "Occult Philosophy," which gives the most complete account of the Cabbala, caused him to gain the reputation of being a magician. Many curious stories were told of his powers in this direction, but there is no real proof that he ever practised magic at all.

AGRIPPA, KING, I. II. See HEROD AGRIPPA I. II.

AGRIPPA, MARCUS VIPSANIUS, a Roman of obscure birth who rose to a high position, both in military and civil affairs. He was born about 63 B.C., and died B.C. 12. He was the main instrument in securing the undivided sovereignty of the Roman empire to his fellow-student, Octavius Cæsar (Augustus). It was at Agrippa's instance that Octavian at once set out for Rome on hearing of the murder of Julius Cæsar, the great-uncle of Octavian. Agrippa accompanied him, and in 41 and 40 took an important part in the war against Lucius Antonius; the capture of Perusia, which brought that war to a conclusion, was in a great measure due to Agrippa. In his consulship, B.C. 37, he gained a victory over the Aquitani, and led a Roman army across the Rhine. A large portion of this year was employed by Octavian in preparing a fleet to oppose Sextus Pompey, whose superiority at sea enabled him to command the whole coast of Italy. Agrippa, who was summoned to Rome on this emergency, began his operations by cutting a passage through the barrier of Hercules, which separated the Lucrine Lake from the sea, and he thus converted that lake and the interior lake of the Avernius into a harbour, which was called Portus Julius. In the following year he annihilated the power of Sextus Pompey, and gave to Octavian the possession of Sicily. In the year 33, though already of consular rank, he held the office of ædile, his administration of which was distinguished by the restoration of the aqueducts, the building of the great Julian aqueduct, the improvement of the sewers of Rome, and the erection of fountains. In the naval victory off Actium (B.C. 31), which left Octavian without a rival, Agrippa was again the admiral of the successful fleet. In reward for these services he shared with Mæcenæ the full confidence of Octavian, who associated him with himself in the important task of reviewing the senate. In B.C. 28, Agrippa was again consul, and married his second wife Marcella, the niece of Octavian. In his

third consulship (B.C. 27), in which year Octavian received the title of Augustus, Agrippa built the PANTHEON, in commemoration of the victory near Actium. Whether this noble work be a temple, or part of a bath, has been a long-standing dispute. The Pantheon will be found correctly drawn in plan and elevation in our Plates on Roman Architecture. Agrippa carried out the design of Julius Cæsar in having a complete chart of the Roman empire drawn up, and wrote a history of the events in which he had taken part, which is now lost. He was thrice married, his third wife being Julia, the daughter of Augustus, by whom he was the father of Cains and Lucius Cæsar, of Julia, of Agrippina the elder, and Agrippa Postumus. Vipsania, his daughter by his first wife, married Tiberius Cæsar, afterwards emperor. The noble, if somewhat stern and irregular, features of Agrippa are well known in bust, statue, and medal, and never fail to arrest the attention of the visitors to the galleries of Rome.

(Appian, "Civil Wars," lib. 3-5; Dion Cassius, lib. 45-54; Livy, "Epitome," 117-136; Merivale's "Romans under the Empire.")

AGRIPPINA, THE ELDER, one of the noblest of Roman matrons, the daughter of M. Vipsanius Agrippa and Julia, married Germanicus (the son of Drusus, and nephew of Tiberius), to whom she bore nine children, among whom were Caligula, afterwards emperor, and the second Agrippina, the mother of Nero. On the death of Augustus (A.D. 14), Germanicus and his wife were with the army on the banks of the Rhine, where Agrippina had occasion to display her firmness of purpose and her courage. In the year 17, the disordered state of the East afforded Tiberius, who had become emperor, a pretext for recalling Germanicus from the command on the Rhine, the more welcome when Tiberius remembered that the devoted soldiers had offered to make Germanicus and not himself the successor of Augustus. Agrippina accompanied her husband, and was with him at Antioch in Syria when he fell a victim, at least such was his own conviction, to the poison of Piso (A.D. 19), sacrificed to the hatred of Tiberius and his mother Livia. He implored his wife on his death-bed to submit to the evil times, but Agrippina, disregarding his advice, landed at Brundisium, in Italy, with the youthful Caligula and her youngest infant, bearing herself the funeral urn of Germanicus; and so great was the indignation of the Roman people, that Piso died either by his own hand or by the order of the emperor. She lived at Rome for some years, the object of the emperor's jealousy and fears, which her proud bearing was calculated to increase. She was finally banished, on a charge of treasonous ambition, to the island of Pandataria, where she closed her life by starvation, 18th October, A.D. 33. Her two eldest sons, Nero and Drusus, were also put to death by Tiberius. (Tacitus, "Annals," lib. 1-16; Suetonius, "Augustus Tiberius," "Caligula.")

AGRIPPINA, the daughter of Germanicus and the noble Agrippina the elder, whose stainless name she had the signal reproach of covering with well-deserved infamy, was born A.D. 14 in the chief town of the Ubii, which she afterwards raised to the rank of a Roman colony, calling it after herself, Colonia Agrippina (now Cologne). She was fourteen years of age when Tiberius gave her in marriage to Cn. Domitius Ahenobarbus, by whom she had a son, who at first bore the name of his father, but afterwards under that of Nero became emperor of Rome. After the death of Domitius her brother, the Emperor Caligula banished her on the ground of her utterly abandoned life; but on the accession of Claudius she was recalled from exile, and became the wife of Crispus Passienus. She is said to have caused the death of Passienus; and when her uncle Claudius put his adulterous wife Messalina to death (A.D. 50), Agrippina secured her uncle's

affections, and he married her, though such a marriage was contrary to Roman usage (Gaius, i. 62). She had influence enough to bring about a marriage between her son Domitius and Octavia, the daughter of Claudius; and she induced Claudius to adopt her son, who thereupon assumed the name of Nero, though Claudius had already a son, Britannicus, by Messalina. In 54 Agrippina completed her ambitious designs by poisoning Claudius, and causing her son Nero to be acknowledged emperor by the soldiers—the murder of Britannicus following almost as of course. Agrippina now ruled the world for the first years of Nero's reign. But the mother and the son could not live in harmony, for each hated and feared the other; and after one or two attempts to shake off her authority Nero caused her to be murdered (59). Agrippina was a woman of literary acquirements, and she wrote some commentaries, of which Tacitus availed himself for his historical writings. Of her infamous character this is not the place to speak with further detail.

AGROS'TIS is a genus of Grasses, consisting of a considerable number of species with loose-branched capillary panicles of flowers and a creeping habit. The upper glume is smaller than the lower; the flowers have hairs at the base, and are single within the glumes; the pales are unequal.

Four species are natives of this country. *Agrostis alba* is abundant in marshy places, where it forms a valuable pasture. Under the name of Irish flurin grass this species has been the object of much attention from experimental agriculturists, some of whom have extolled its qualities very highly as a marsh fodder. In England it is best known, along with *Agrostis vulgaris*, under the name of quitch, or cracks, and is generally extirpated as a troublesome weed in consequence of the rapidity with which, by means of its creeping, rooting, vivacious stems, it spreads and overruns pasture and garden ground. *Agrostis setacea* is found on dry heaths in the south-west of England; *Agrostis umbellata* on peaty heaths. The latter is the species that is eaten by deer.

AGTELEK, a village of Hungary, in the county of Gemer, near the road from Pesth to Kischin. In the vicinity is the famous stibnite grotto of Baralla (i.e. a sulphuring place, one of the most remarkable in Europe). The entrance is about $3\frac{1}{2}$ feet high by 5 wide, but afterwards a series of caverns is reached in succession, the largest and most imposing of which is the Flower-garden. It extends for about 900 feet in a straight line, has a height of 96 feet, and a width of 90. Others, from their remarkable appearance, have received the names of the Mexican Altar, the Image of the Virgin, &c.

AGUAS CALIENTES, a town of Mexico, capital of the state of the same name, is situated on the west side of a table land, 6000 feet above the sea, and is distant 65 miles from Zacatecas, and 270 from the city of Mexico. Its name is derived from the hot springs in the neighbourhood. It has a good climate, is well built, and produces fruits in abundance. There is a considerable woollen manufacture carried on, as well as a large general trade. Population, 23,000. There is a town in Peru of the same name.

AGUE belongs to the class of febrile diseases, and is indeed commonly considered as an example of fever in general. Fevers are divided into three great classes. In the first the morbid phenomena which constitute the disease continue for a certain length of time and then wholly disappear. After having been some time absent they re-appear, and this repetition and return of the phenomena alternate with each other several times. The period that elapses between the cessation of the febrile phenomena and their recurrence is called an intermission. Such fevers, to wit, as are attended with a cessation or

intermission of the febrile symptoms for an observable space of time, are for this reason called *intermittent fevers* or *agues*. This is the first class. In the second class the febrile symptoms do not altogether disappear, but merely diminish in violence; they do not *intermit*, they only *remitle*; for this reason they are called *remittent fevers*. In the third class, during the whole course of the disease there is not only no retrocession of the symptoms, but no notable diminution of their violence. Such as the phenomena are when the fever is completely formed, such they continue to be with scarcely any variation until its close. For this reason this class of fevers is denominated *continued fevers*.

The concurrence and succession of phenomena which constitute a fever is called a *paroxysm*. An intermittent fever or an ague is therefore a fever consisting of a succession of paroxysms, between each of which there is an intermission more or less complete.

The phenomena which constitute a paroxysm of fever are the following:—The person is affected first with a loss of mental vigour, commonly indicated by inaptitude to attend to his usual avocations, or by dulness or confusion of mind. If not simultaneously with, very shortly after this mental debility, there comes on a sense of physical weakness. The patient is languid, listless, disinclined to move, while every movement is performed with difficulty, and the effort is exhausting. The muscles or organs of motion are not merely weak, they are at the same time the seat of several uneasy sensations; the muscles of the extremities, and of the back especially, are affected with the sensation of soreness, as if they had been over-exercised, and this soon increases to decided pain, which is often very severe.

The next train of symptoms is ushered in by pallidness of the face and extremities; the features shrink; the bulk of the external parts is diminished; and the skin over the whole body is in a morbid state, as if drawn tight. Some degree of coldness is now felt, which at first is so slight as scarcely to be noticed, but at length the patient is fully conscious of a sensation of cold, which he commonly feels first in his back, but which thence extends over the whole body. This sensation of coldness increases until it becomes so severe as to produce a tremor in the limbs, amounting sometimes to trembling and shaking, and almost always producing distinct shivering.

From the first approach of the mental and physical languor the pulse becomes weaker than in health. As the sense of cold comes on the weakness of the pulse is still greater, and it is at the same time always more frequent than natural, often irregular, and sometimes intermittent. The respiration is also shorter, feebler, and more frequent than in a state of health. The appetite fails; there is sometimes even an aversion to food. Frequently the loss of appetite is succeeded by a sense of nausea and sickness, which occasionally increases to vomiting; and with the matter vomited there is, for the most part, a mixture of bile. From the commencement of the paroxysm there is generally some degree of thirst, which increases in urgency as the sensation of cold advances, being always proportioned to, and probably arising from, the dryness and clamminess of the mouth and fauces. Not the secretions of the mouth alone, but all the secretions of the system are diminished. They are also lessened in quantity, especially the urine, which is scanty and nearly colourless, and the alvine evacuations are usually altogether suppressed. Even in this stage headache may come on, but it usually does not appear until the following stage.

These symptoms, having continued for some time, at length disappear, and a remarkable change takes place in the character of those that succeed. The sensation of cold gives place to that of heat, and a temperature far greater

than that of health prevails over the whole body. The face, which had been pallid, now becomes flushed and red. The eyes, which had been dull and heavy, are now more bright and glistening than natural. The features of the face and the other parts of the body recover their usual size, and become even more turgid. The pulse becomes more regular, strong and full, the respiration fuller and more free, and the nausea and vomiting are less urgent. If before there was pain in the head, it now increases in severity; if there was none, it is now sure to come on, and while the sensibility is increased, the intellectual operations are more and more disordered.

By degrees these symptoms also pass away, and are succeeded by a different train. A moisture now breaks out first on the forehead, which by degrees extends over the whole body. As the perspiration flows the heat abates; the pulse becomes slower and softer, the respiration more free; the nausea and vomiting cease; the thirst diminishes; the secretions and excretions are restored; most of the functions return to their ordinary state, and the patient is left comparatively free from disease, feeling only weak and exhausted.

Such are the phenomena which constitute a febrile paroxysm, and such is the order of their succession. They obviously constitute three distinct states, or, as they are called, stages or fits, viz. the cold, the hot, and the sweating stage.

It sometimes happens that two intermittents attack the same person at the same time, or that in addition to the ague the patient may, if it is in the summer, suffer from irritation of the stomach and diarrhoea; or if in the winter, from bronchitis or congestion of the lungs. The ague is then said to be complicated. As the result of repeated attacks of ague, the spleen becomes hardened and enlarged, and may be felt under the ribs on the left side as a hard mass, which is generally known as "ague cake."

From the preceding history of the disease it is clear that the distinguishing character of intermittent fever is the regular return of the paroxysm at a fixed period, the entire cessation of it after a certain time, and the renewal of it after a specific interval, according to the species of the ague. Nevertheless, though these distinct intermissions and accessions are always apparent when the ague is regular, yet in the most severe and formidable cases it entirely loses its intermittent character, and assumes a remittent or even a continued form.

Exciting Causes of Ague.—It is universally admitted that the exciting cause of this malady is to be found in certain invisible effluvia or emanations arising from marshes or decaying vegetable matter. Of the nature of these effluvia nothing is known, though some of the most distinguished chemists have investigated the subject, and even the presence of these vapours is only known by their effect upon human beings.

The disease is not now very common in England, and is chiefly confined to Essex, Cambridgeshire, Lincolnshire, and Norfolk—districts in which there are large marshes and tracts of low-lying ground which are occasionally covered with water. In former times it was very prevalent, and James I. and Oliver Cromwell both died from tertian ague contracted in London—a place where the disease is hardly known at the present day.

In Holland the low and level coast is a fertile source of intermittent fever, and in Italy the Pontino marshes and the district of the Maremma are notorious for the noxious influence they exert upon the inhabitants and upon travellers who pass through them at certain seasons. It is also very common in tropical countries, and in India it is very prevalent in Bengal and the upper provinces.

Although the nature of the malaria poison is not understood, many facts have been learned as to its characteris-

tics. Thus it is well known that it is capable of being carried by the wind, after the manner of a fog, but that it seldom ascends any height—in temperate climates rarely rising higher than 500 feet; so that it is possible to live near a miasmatic neighbourhood, and yet escape its ill effects, if the residence is built upon a hill. Thus the inhabitants of the Plumstead marshes, near London, sometimes suffer from ague, while their neighbours who live upon Woolwich Hill, close adjacent, are not troubled by the complaint. When the malaria passes over sheets of water, especially salt water, it appears to lose its power; and belts of trees exert a most powerful influence in arresting and neutralizing its influence. It is always more powerful near the ground, and is more dangerous during the night than the day.

In passing through a malarious district care should be taken not to be out during the night or very early in the morning. The highest room that can be obtained should be chosen for a sleeping chamber, and all windows should be shut at sunset. Trees should be avoided at night time, and on special occasions a respirator or handkerchief placed over the nose and mouth will act as a protective. Persons compelled to pass through or stay in such a district should if possible live generously: a moderate amount of stimulant will be found beneficial. Quinine is also of great service in warding off attacks, and should be taken daily in small doses.

Treatment of Ague.—The first object in the treatment of a person affected with ague is to remove him from the influence of the poison, and where he cannot be removed to a more healthy district he should, if possible, be put in the highest room of a house—it being the least exposed to the miasma. During the cold stage the patient should be wrapped up warmly in bed; hot-water bottles may be applied to the feet, and he should be allowed to drink any simple beverage, such as tea, barley water, or weak wine and water. During the hot stage the warm bed-clothes should be removed, and the patient should be permitted to allay his thirst with any simple cooling drink that may be convenient. As soon as the sweating stage has passed quinine should be administered in rather strong doses. Thus, if the attack be quotidian, 10 grains should be taken during the close of the sweating stage; a second dose of the same amount should be taken about five or six hours later; and a third about two hours before the time when the next paroxysm would be expected. Very often this will result in the cure of the patient, and he may have no more attacks, although he often has one or two slight ones before becoming convalescent. The use of quinine should be continued, however, for a short period in doses of 5 grains every four hours until it has produced its full effect. Taken in large doses it produces giddiness, singing in the ears, and deafness; but these effects will pass away of themselves. When these symptoms appear, the quantity taken should be reduced, and should be used less frequently. It will be necessary to be very careful of the health for some time afterwards, and, by way of precaution against a relapse, quinine should be taken about a lunar month from the attack—that being the time when a return is to be most feared. When the bowels are confined during an attack a blue pill should be taken at bedtime, and if the tongue is very foul and the stomach loaded with food an emetic will be found useful. If the stomach is too irritable to retain the medicine it may be administered by an injection. The diet should be liberal and nourishing; strong beef tea, soup, and milk should be freely taken, and meat or fish may be eaten if the patient cares for them. A little wine may be taken daily, and sometimes the use of spirits will be found of service. No remedy for ague is so powerful, effective, and simple as quinine, and none is so generally successful; but where it cannot be

obtained, or where it fails to have effect, other medicines are used as adjuncts or substitutes. Of these we may mention gelsemium, which is very useful by itself, and which, when combined with quinine in the proportion of 10 minims of the tincture to 10 grains of quinine, will often effect a cure where the quinine given alone has failed. Salicine, obtained from willow bark, in doses of 30 grains dissolved in hot water, every two hours, or the decoction of willow bark itself, may be used; but the remedy most generally adopted in the place of quinine is arsenic. This, though inferior to quinine, is a valuable remedy for ague, and it is used in the French army for that purpose on account of its being less costly. It should never be taken, however, except under medical advice, and it is apt to produce soreness of the throat, sickness, diarrhoea, and pains in the abdomen.

Where ague is complicated with other diseases the treatment must be modified accordingly, and in such cases medical aid is imperatively necessary.

AGUESSEAU, HENRI FRANCOIS D', a chancellor of France. He was born 27th November, 1668, at Limoges. His father, who was *intendant* of that province, devoted himself to the education of his son; and he brought him early into notice. At the age of twenty-one he was admitted an advocate at the *Châtelet*; and three months afterwards he was made one of the three advocates-general. In the year 1700 he was appointed *procureur-général*, in which office he employed his authority in most cases wisely and honestly. He reformed the system of the management of public hospitals; and endeavoured to define the limits of particular jurisdictions, to introduce uniformity in the administration of justice throughout the kingdom, and to institute the making of a testamentary disposition of property. D'Aguesseau aspired through life to the high but difficult reputation of a legal reformer; and it is in this particular that his character has the greatest claim upon our respect. His praiseworthy attempts were resisted by many whose mistaken interests suggested to them that the attainment of justice ought to be kept expensive and uncertain, instead of being rendered cheap and secure. In 1717 D'Aguesseau succeeded Voisin in the chancellorship. He did not retain the office long, for he was dismissed and exiled the following year, on account of his opposition to Louis's financial system. His perception of the fallacy of that adventurer's schemes for substituting fictitious wealth for real capital, showed that in some points of political philosophy his views were sound. His recall two years afterwards, at the moment of the great crisis brought about by Louis's system, was a signal triumph for D'Aguesseau. But Cardinal Dubois, the unworthy favourite of the regent, claimed precedence in the council, and D'Aguesseau retired from office in 1722 rather than yield to him. He lived quietly at Fresne until 1727, when he was reappointed chancellor. During the five years of his retirement he assiduously cultivated those literary tastes which so greatly distinguished him amidst the mass of mere lawyers. From the time of his reappointment to office till 1750 he continued to administer justice uninterruptedly. He then resigned, and died the following year. D'Aguesseau was buried by the side of his wife in the churchyard of his parish church. A statue representing him is now in front of the *Palais Législatif* (Chamber of Deputies), by the side of the one erected in honour of L'Hôpital. It was placed there in 1810.

His works consist principally of his pleadings and appeals when advocate and *procureur-général*, and of his speeches in Parliament.

AGUILAR DE LA FRONTERA, a town of Andalusia, Spain, in the province of Cordova, 22 miles from the city of the same name, on the left bank of the river Caera. It has three fine public squares, its houses

are well built, and the town is remarkably clean and regular. The monastery of St. Clara has some fine paintings. Near the church are the remains of what was once a splendid Moorish castle. The Montilla wines are produced in the district, and there is also some trade in oil and corn. Population, 12,000.

AGUL'HAS, CAPE, the most southerly point of Africa, 100 miles E.S.E. of the Cape of Good Hope. It gradually slopes from the shore until about a mile inland it reaches a height of 455 feet. A lighthouse erected nearer the shore displays a light 128 feet above high-water mark. The Agulhas Bank is of immense extent, and stretches as far as the Great Fish River, having an average breadth of about 100 miles. The water over it is comparatively shallow, and it abounds with fish. A swift current flowing from the Indian to the Atlantic Ocean clearly defines it.

A'HAB, King of Israel, succeeded his father Omri 919 B.C., and reigned over Samaria twenty-two years. He appears to have been an able and courageous monarch, and to have united the warring factions that, previously to his reign, had divided the nation. He defeated the Syrians twice, and concluded a treaty on favourable terms with Benhadad their king, and he received a yearly tribute of 100,000 lambs and an equal number of rams from the neighbouring kingdom of Moab. He is spoken of in 1 Kings xxii. as having erected an ivory palace and built new cities, and it is probable that he had a share in the commerce of Phœnicia. He married Jezebel, the daughter of Ethbaal, king of the Sidonians, and acting under her influence introduced, or largely encouraged, the worship of Baal and Astarte in his kingdom. For a time the new worship appeared triumphant, but the adherents of the old faith were rallied by the prophet Elijah, one of the grandest characters in the Old Testament, and the worship of Jehovah maintained its ground until it was restored as the national religion by Jehu. Ahab was killed in battle with the Syrians 897 B.C., and fourteen years later his dynasty was extirpated by Jehu. Jezebel, who had outlived Ahab, was included in the massacre.

Another Ahab is mentioned in the book of Jeremiah, xxix. 21, 22, who is charged with being a false prophet, and is threatened with a terrible punishment.

AHANTA, the name of a district on the Gold Coast, Africa, formerly subject to the sovereign of Ashantee. It occupies the space along the coast between 3° and about 2° 10' W. lon.; its breadth from north to south is very inconsiderable. On the west is the river Aneobra, on the east the river Boosempa. The principal projection of the coast is Cape Three Points. It is well wooded, and the sugar cane is cultivated; a part of the district abounds in fine gold. The Dutch settlements here, Axim, &c., were transferred to the British crown in 1873.

AHASUE'RUS, the Latinized form of the Hebrew *Ahashverosh*, occurs as the name of a Persian or Median monarch in three places in the Old Testament, viz. throughout the Book of Esther, Daniel ix. 1, and Ezra iv. 6. It is probably, like Pharaoh, a royal title, and not a proper name. Concerning the identity of the Ahasuerus of the Book of Esther, various opinions have been expressed by both ancient and modern scholars, but the theory that obtains the widest acceptance at the present time identifies him with Xerxes, the unsuccessful invader of Greece.

In the reference in Daniel ix. 1 it is probable that Cyaxares, the father of Atyages, is referred to; and the Ahasuerus of Ezra iv. 6 is generally taken to be Cambyses.

AHMED III., son of Sultan Mohammed IV., was raised to the throne of the Ottoman empire in consequence of a revolt of the Janissaries in 1702. When, in 1709, Charles XII. of Sweden took refuge at Bender, in the Turkish dominions, he was well received by Ahmed, who

made him a present of 16,000 ducats. Charles XII. succeeded in kindling a war between the Ottoman Porte and Russia, which turned out favourably for the Turks. Peter was near being captured on the banks of the Pruth, and though he escaped he was obliged to resign to the Turks the important town of Azof. Ahmed III. also compelled the Venetians to quit the Morea, and to give up the islands of Cerigo and Cerigotto, and their possessions in Candia. But in an attempt to take Hungary from the Austrians his army was defeated by Prince Eugene, near Belgrade, and by the subsequent peace (made at Passarowitz in 1718) that town, as well as Orsova and part of Servia and Wallachia, came under the Austrian dominion. In 1723 Ahmed entered into a treaty with Russia, and soon afterwards commenced a successful war with Persia, and his conquests were confirmed by a peace; but Nadir Shah, the successor of Ashraf Khan, disregarded these stipulations, and by degrees retook the conquered provinces. These reverses caused a revolt at Constantinople, and Ahmed III. abdicated the throne in favour of his nephew, Mahmud I. (1730). He died six years afterwards in prison, at the age of seventy-four.

AHMEDABAD, a district and city of British India, in the province of Gujerat and presidency of Bombay, between $21^{\circ} 4'$ and $23^{\circ} 5' N.$ lat., and $71^{\circ} 2'$ and $73^{\circ} 25' E.$ lon. The boundaries of the district are Katthiawar on the N. and W., the Gulf of Cambay on the S., the Kaira collectorate on the S. and E., and Mahi Kanta on the E. and N. The area is 3844 square miles. An extensive plain occupies the western part of the district, from which the ground gradually rises in a north-easterly direction, where various small hills dot the country. The soil, generally speaking, is fertile, and well wooded in places. The climate, except on the sea-coast, is variable. Between November and February, periods of severe cold occur; and in the hot season, February to June, the heat is very great. The water supply is not good; the rain-fall is stored in cisterns by the more wealthy classes. The chief products are wheat, bajra, rice, and cotton; the sugar-cane and tobacco plant are also cultivated. The population in 1881 was 840,000.

AHMEDABAD, a fortified city on the banks of the Sabarmutti, capital of the above district. Its condition is still flourishing, and it ranks as the second town in the presidency; but it formerly enjoyed great prosperity, and was one of the largest cities of India, having a trade, amongst other things, in gold and silver. Its principal streets are wide enough for ten carriages abreast. It passed from under the sway of the Mohammedans to the Mahratta chieftains, and in 1818 came into the possession of the East India Company. The population in 1881 amounted to 125,000. The town is the headquarters of the north division of the Bombay army, and has some important silk and cotton manufactures. It suffered considerable damage from an earthquake in 1819, but can still boast of several fine mosques and temples of great architectural beauty. Railway communication with Bombay, 310 miles distant, was established in 1865.

AHMEDNAGAR or **AHMEDNUGUR**, a district and city of British India, in the Deccan, presidency of Bombay, lying between $18^{\circ} 8'$ and $19^{\circ} 50' N.$ lat., and $73^{\circ} 40'$ and $75^{\circ} 37' E.$ lon. Its N.E. boundary is formed by the river Godavary, that on the W. by the Western Ghats, on the S. by the Beema and Sholapore collectorates, and by the Nizam's dominions on the E. The area is 6647 square miles. The district, which is well watered, produces wheat, bajra, and other grain, as well as betel leaves, sugar-cane, and some cotton. Weaving forms the chief industry. The population in 1881 was 790,000, consisting principally of Mahrattas and Kunbis; the latter form the agricultural classes.

AHMEDNAGAR, a strongly fortified city, capital of the above district, was founded in 1493 by Ahmed Nizam Shah. On the same site formerly stood a more ancient town called Bingar. It subsequently passed into the hands of the Peishwa, by whom it was ceded, in 1797, to the Mahratta chief Dowlat Rao Scindia. General Wellesley captured the city in 1803, and after being restored to the Mahrattas it passed into the possession of the East India Company in 1817. It contains a handsome square or market-place, and numerous well-built streets. The palace of the former sultans is a massive building, surrounded by a broad moat, faced by solid masonry. There is a good supply of water. The population in 1881 was 33,000. It is distant 83 miles from Poona, 161 from Bombay, 830 from Delhi, 1119 from Calcutta, and is an important railway station on the Great Indian Peninsular line.

AHMEDPUR, a town of the Punjab province, British India, in the native state of Bahawalpur, 30 miles south-west of the town of that name. Its buildings are mostly of mud; but it has a handsome mosque, with four tall minarets. The trade consists chiefly of the manufacture of arms, gunpowder, silk, and cotton. There are several other towns in India of this name.

AHRIMAN or **AHRIMANES**, in the Zendavesta, is the name given to the malignant or destroying spirit, opposed to Ormuzd, the principle of good, and symbolizes darkness as opposed to light. According to the doctrines ascribed to Zoroaster, the earth is the scene of a conflict between these hostile powers, and the warfare extends throughout the whole of nature. In this way Ahriman is regarded as the author of all the destructive forces of the physical world, the poisons of plants, hurtful weeds, the ferocity of wild animals, and the physical and moral evils of humanity. The duty of man is to side with Ormuzd, and by purity, temperance, truthfulness, and the destruction of evil things, to do battle with Ahriman. In the end, after a conflict of 12,000 years, Ormuzd will prove victorious over Ahriman, and those who have laboured with him are to share in his triumph. By many scholars it is thought that the later belief of the Jews concerning Satan was derived from their connection with the Persians, and their becoming acquainted with the doctrines concerning Ahriman. In the earlier Jewish Scriptures Satan is referred to as an accusing angel; but subsequently to the Captivity the conception becomes that of an enemy to God, resembling in very many points the evil spirit of the Persians. There is little doubt that the idea of the contest between the purely spiritual powers, Ormuzd and Ahriman, was originally derived from the idea of the contest between the sunlight and the clouds or darkness.

AHWAZ or **AHWUZ** is a town in Persia about 100 miles N.E. from Basra or Bussorah, and 48 miles S. from Shuster. The ruins of the once prosperous and ancient city lie on the east bank of the river Karun, $31^{\circ} 20' N.$ lat., $48^{\circ} 50' E.$ lon., in a flat and uncultivated country. The modern town occupies only a small portion of the old site, and exhibits a mean and solitary appearance—the houses being almost entirely built of stone brought from the ruins, which are of great extent. The population at present does not exceed 1600. There are remains of a palace and a bridge, also of a *bund* or dyke that was thrown across the river, chiefly, if not entirely, to favour irrigation, by thus making a head of water. Ahwaz is generally supposed to be much less ancient than either Babylon, Persepolis, or Susa. Alexander the Great navigated the Karun, but his historians do not mention Ahwaz.

AI (*Bradypus tridactylus*), one of the names of the common or three-toed sloth. The sloths constitute a very remarkable section or family of the order BRUTA, belonging to the class Mammalia. The sloths are leaf-eaters, and

arboreal in their habits; they never voluntarily leave the trees, the branches of which they tenant, traversing along them in quest of food, not, however, like the monkey, but suspended from them by means of their long hooked claws, with the back downwards. In this manner they travel with considerable despatch, and pass from tree to tree, their long, hook-furnished arms enabling them to reach a branch at a considerable distance. When we contemplate the skeleton of the sloth (Plate I, fig. 5, MAMMALIA) the great length of the fore limbs is at once apparent; they are twice as long as the hinder pair, but all are alike terminated by huge hook-like claws. The pelvis is of great breadth, separating the thigh-bones to an unusual distance from each other, and the latter are directed obliquely outwards, while the limb from the knee downwards has an inward inclination. The structure of the wrist and ankle is such that the palm or sole, instead of being directed to the surface of the ground, as in other animals, is turned inwards towards the body in such a manner as to render it impossible for the sloth to place the sole of its foot straight down on a level surface, compelling it, under such circumstances, to rest upon the external edge of the foot. The hip-joint, as in the orang-outang, is destitute of the *ligamentum teres*, whence the head of the thigh-bone is endowed with greater freedom of motion. The neck of the



The AI.

ai was thought to consist of nine vertebrae, but some anatomists consider that the so-called eighth and ninth neck-vertebrae are in reality true dorsal segments. In all the species the two halves of the skull are separated by large ossicles, so that the small brain is defended by a double case, a provision against accidental falls, should the branch to which the animal is clinging give way. The clavicles are united to the scapular bones of the metacarpus and metatarsus are adhered to the first phalangeal row of the fingers and toes, the whole being consolidated into one piece, buried in the skin; the claws alone are distinctly unencased, and these are drawn in elastically to the palm or sole by powerful elastic ligaments. Rigid, however, as the parts, the skin can use it as an organ of prehension, and convey food to its mouth. The teeth are very small, there are no incisors, but canines and molars only. In the ai the canines are diminutive, and resemble the molars; the latter are four in each side in the upper jaw, and three in the lower; they are cylindrical and destitute of true roots and are fitted merely for breaking down the tender buds and leaves on which the animal feeds. The head of the ai is short, the muzzle small, the ears are concealed in the long hair; the eyes deeply set; the tail is a cone inclining. The ribs in the ai are thirty-two.

The sloth are natives of the forests of South America, and are killed by the Indians for the sake of their flesh;

they are a favourite prey, also, of the harpy eagle. Unfitted by their structure for the ground, they pass their lives clinging to the branches of the forest, where they rest and travel in security. Their muscular power is enormous, and their tenacity of life astonishing. When attacked they defend themselves with their arms; and on the ground, constrained as are all their movements, they have been known to grasp a dog and hold it, as if within a vice, till it expired. In this manner they grapple with large snakes which infest the dense woods and the humid situations where the *Cecropia* grows, on the buds and young shoots of which the sloth principally feeds.

The female has two mammae, situated on the breast, and she brings forth a single young one at a birth, which clings to its parent, and is carried by her till it acquires sufficient size and strength to shift for itself.

The sloth sleeps with ease and safety in the fork of a tree, its limbs embracing the trunk, and its back resting in the angle of a branch, while the head is buried in the long wool of the bosom, and the animal is rolled up nearly in the form of a ball. The length of the neck of the ai enables it to assume this position; and not only so, but to turn its head round with the greatest ease, and, while suspended aloft, to survey the ground beneath in every direction, and thus observe the approach of enemies.

The ai, of which there are several species, are covered with long coarse hair of a peculiar character, not unlike dry and withered grass. From this appearance of the fur, and from its colour, it is difficult to detect these animals while at rest among the branches covered with long moss and lichens. Their voice is seldom heard; it is a weak, plaintive cry resembling the word *ai*, whence their name. The two-toed sloth, or unan (*Bradypus didactylus*), differs in many structural details from the ai, and is more active and alert, but its general habits are the same. We may conclude by observing that their organization is in perfect harmony with their habits and instincts, as much so as that of the bats for flight, or of the whale for the waters of the ocean. If not intelligent they at least enjoy their existence, and fulfil their appointed part in the economy of creation.

AIDE-DE-CAMP, a French term which denotes a military officer, usually of the rank of captain, one or more of whom is attached to every general officer, by whom all his orders are conveyed to the different parts of his command. A field-marshal is entitled to four, a lieutenant-general to two, and a major-general to one. The queen appoints as many aides-de-camp as she pleases, and this situation confers the rank of colonel. The number of aides-de-camp to the queen is generally about thirty, besides about twelve naval aides-de-camp, one of whom is of the rank of admiral.

AIDIN, a town of Asiatic Turkey, capital of a vilayet of the same name, in the pashalik of Anatolia, situated on the river Meander. It is also named *Guzel-Hissar*. Aidin lies 54 miles south-east from Smyrna, with which it is connected by railway, as also with Ephesus, and ranks in commercial importance next to the former city. It is celebrated for its figs. The present population is about 30,000.

AIDS (directly from the French *aides*, which in the sense of a tax is used only in the plural number). Under the feudal system aids were claims of the lord upon the vassal, which were not so directly connected with the tenure of land as reliefs, fines, and escheats. The nature of these claims, called *auxilia*, seems to be indicated by the term; they were originally rather extraordinary contributions than demands due according to the strict feudal system, though they were founded on the relation of lord and vassal. These aids varied according to local custom, and became in course of time oppressive exactions. The aids

which are mentioned in the Grand Coutumier of Normandy for knightng the lord's eldest son, for marrying his eldest daughter, and for ransoming the lord from captivity, were also in use in England, and were probably introduced by the Normans. But other aids were also established by usage or the exactions of the lords, for by Magna Charta, c. 12, it was provided that the king should take no aids, except the three above mentioned, without the consent of parliament, and that the inferior lords should not take any other aids.

The amount of the two aids for knightng the lord's eldest son and marrying his eldest daughter was limited to a certain sum by the Statute of Westminster 1, 3 Ed. I. c. 36. The aid which was to ransom the lord when taken prisoner was of course uncertain in amount. Aids for knightng the lord's son and marrying the lord's daughter are abolished by the statute 12 Car. II. c. 24, and the aid for ransoming the lord's person is obsolete.

Aids is also a general name for the extraordinary grants which are made by the House of Commons to the crown for various purposes. In this sense aids, subsidies, and the modern term supplies, are the same thing. The aids were in fact the origin of the modern system of taxation.

Aid of the King.—When a tenant of the crown is required to pay rent by others he may apply for the advice of crown counsel, and in such case proceedings are stopped until the counsel have been heard on behalf of the sovereign.

Aurilia is the Latin word used by Bracton and other writers when they are speaking of the feudal aids above enumerated. The word *aide* is derived from the Low Latin *adivda*. (Du Cange, "Gloss. Med. et Infim. Latin.") The Spanish form *ayuda*, "assistance," and the Italian *aiuto*, also clearly indicate the origin of the word "aide," which is from the participial form *adjuta* of the Latin verb *adjurare*.

AIKIN, JOHN, M.D., born in 1747, was the only son of the Rev. John Aikin, D.D., for many years tutor in divinity at the dissenting academy of Warrington, in Lancashire. He was educated chiefly at Warrington, and having chosen the medical profession, he studied at the University of Edinburgh, and was subsequently a pupil of Dr. William Hunter. As a surgeon he first settled at Chester, and afterwards at Warrington; but finally took the degree of Doctor of Medicine at Leyden, and established himself as a physician in London. He is now chiefly remembered as a popular author; and to him, in conjunction with his sister, Mrs. Barbauld, we owe some of the first and best attempts to take science out of the narrow confines of the professionally learned, and to render it the means of enlarging the understanding and increasing the pleasures of the general body of readers. The most popular as well as the most useful of Dr. Aikin's works still maintains its reputation—"Evenings at Home." The volumes of this work appeared successively, the sixth and last in June, 1795. This was the joint production of Dr. Aikin and Mrs. Barbauld, whose contributions, however, did not exceed half a volume in the whole. The object of these volumes was a favourite one with their authors, who desired to teach things rather than words. In the execution of the task they presented, in a manner sufficiently attractive to engage the attention of young persons, a good deal of natural history, with some of the elements of chemistry and mineralogy; but the principal charm and value of the work consists in its just views of human character, and in the uncompromising integrity visible in every line. Another work of Dr. Aikin's has been the foundation of many descriptions of the appearances of nature; but none have surpassed "The Natural History of the Year" in conciseness and accuracy.

The professional success of Dr. Aikin seems to have been impeded by his zealous endeavours to obtain a recognition from the state of the great principle of liberty of conscience; he was, moreover, of delicate health. In 1798 he relinquished his profession, and passed the remainder of his life at Stoke Newington, constantly employed in various literary undertakings, of which the entire number was very large. He died of a stroke of apoplexy, December 7, 1822.

AIKIN, LUCY, the daughter of the preceding, an amiable and accomplished authoress, was born at Warrington 6th November, 1781. She rendered great assistance to her father in several of his later works, and produced many of her own. Among these may be mentioned the "Memoirs of the Court of Queen Elizabeth," published in 1818, and the "Memoirs of the Court of James I." in 1822. These were very successful, and may be regarded as her best works. She also published another of the same kind in 1833, entitled "Memoirs of the Court of Charles I." and a "Life of Addison" in 1843. She died at her residence at Hampstead, 29th January, 1861.

AIL'SA CRAIG, an insulated rock, 10 miles from the coast of Ayrshire, at the entrance of the Firth of Clyde, rising abruptly to a height of 1114 feet. On the only accessible side—the east—are the ruins of an old tower. A few temporary residents take up their abode on the island for the purpose of capturing the eggs and feathers of sea-birds, which resort here in considerable numbers. Rabbits and goats are also found. The island gives the title of inquisit to the Kennedy family.

AIN, a department of France consisting of the former province of Bresse and a part of Burgundy, is bounded N. by the department of Jura, E. by Savoy and Switzerland, S. by the department of Loire, and W. by those of Rhône and Saône-et-Loire. It lies between 45° 36' and 45° 30' N. lat., and between 4° 40' and 5° 55' E. lon., and is traversed by the railway from Paris to Lyons and its branches. The greatest length of the department is 69 miles from N.W. to S.E. and its greatest breadth at right angles to the length about 50 miles. Its area is 2288 square miles; the population in 1882 was 363,172.

It is divided by the river Ain, from which it takes its name, into two nearly equal parts. The easterly division is bordered on the S. and E. for a distance of about 110 miles, by the river Rhône, which is navigable for steamers from Seyssel to its mouth. The department consists of mountains intersected by deep fertile valleys, which generally run from N. to S., and are furrowed by rapid streams. The mountains branch off from the Jura and the Alps, and their summits rise to a height of 4000 to 5400 feet. They contain extensive forests of pine and oak. Iron, asphalt, marble, and lithographic stone are found. The westerly division consists of an undulating table-land, inclining towards the N.W.; the Saône, which is navigable for steamers from Lyons to Châlon, flows on its western boundary for about 70 miles. The soil is a light vegetable mould, resting on a compact clay bottom, which accounts for the great number of marshes and ponds in this division. The quantity of marsh, moor, and forest land greatly preponderates; but in the north, which is drier, there is some good land, which is well cultivated. The chief occupation of the inhabitants in the whole department is agriculture. The climate is cold but healthy in the northern and eastern parts; the marshy district on the right bank of the Ain is cold, damp, and unhealthy.

Ain is watered by a great many small rivers, the chief of which are—the Ain, the Valserine, the Reyssouse, the Veyre, and the Chalarene. The Ain rises in the Jura Mountains near Nozeroy, runs through the department with a rapid course from N.E. to S.S.W., and enters the Rhône opposite the village of Anthon, having run 105 miles.

Timber and firewood are floated down it to the Rhône. Boats are built at several places on its banks, and floated down empty to Lyons for sale.

The area of Ain is 1,464,582 acres, 160,000 of which are covered with forests, and 40,000 with vineyards. Barley, oats, and maize are the principal crops; wheat is grown, but not in quantity sufficient for the consumption of the department. Wines are made, the best of which are the red from the environs of Belley and the white of Pont de Vevle. The number of horses, sheep, goats, and swine is very great, and very many oxen are fattened on the fine grass lands of the Reyssouze and lower Chalonne. The department is famous for its poultry and honey. The principal trade is in provisions, timber, fir and oak planks, asphalt, lithographic stones, and the products of its factories, silk, cotton and woollen cloth, glass, paper, and leather.

The chiefs towns are Bourg, Belley, Nantua, Gex, and Trevoux, from which the several arrondissements take their names.

AINSWORTH, ROBERT, was born near Manchester in 1680. He was educated at Bolton, where he afterwards taught a school. He then came to London, and about the year 1714 he was induced by the offers of the booksellers to commence the compilation of his Latin dictionary, but the work did not appear till 1736. The best edition of the work is that which appeared in 1816, in one volume 4to, under the care of Dr. Carey. This dictionary was very creditable for the time, but may now be considered as superseded by other more accurate works. Ainsworth died in London on the 4th of April, 1743.

AIN-TAB, a town of Syria, in the Turkish eyalet or government of Maash, is situated on the north bank of a small river which falls into the Sagur, in 37° 3' N. lat., 37° 27' E. lon. It is a large well-built town, unwallled, but defended by a strong castle on an artificial eminence, which is surrounded by a deep ditch. It has manufactures of linen, cotton, morocco leather, and saddles. There are five or six mosques and a large Armenian church. The inhabitants, amounting to about 20,000, are chiefly Mohammedans, intermixed with Armenian Christians and Greeks. Ain-tab is about 65 miles N. by E. from Aleppo.

AIR is the gaseous fluid which surrounds the earth. It is mainly composed of nitrogen and oxygen, of which it is a mixture, and not a chemical compound, although the relative quantities of the constituent gases remain the same, or nearly the same, from whatever part of the earth it may have been obtained. Air when shaken up in water is partly dissolved; if the water be boiled the oxygen and nitrogen in the dissolved air will be found to be in the proportion of 1 to 1.87, instead of the usual proportion of 1 to 4. Air has been found by careful experiments to contain about 21 volumes of oxygen per cent., and about 23 parts by weight of nitrogen. It also contains small quantities of carbonic acid, aqueous vapour, and ammonia. It is 773 times lighter than water.

Torricelli was led to the invention of the **BAROMETER** by the discovery that air possessed weight, that is, was acted upon by the force of gravity. This property of air may be proved by weighing a flask exhausted of air [see **AIR-PUMP**], and suspended from one end of a delicate balance; if the cork of the flask be opened the air will enter the flask, and cause it to immediately sink. This being so it follows that the air must exert a pressure upon all bodies which are in contact with it, and experiments prove that near the surface of the earth the pressure is equal to about 15 lbs. to every square inch. This amount of pressure is called "an atmosphere." From this it will be seen that an enormous pressure must be exerted on all portions of the body of any animal. This pressure is neutralized, however, by the outward pressure of the solids, liquids,

and gases of the body. This great atmospheric pressure is illustrated by the following experiment. Two hollow hemispheres (called Magdeburg hemispheres, from the inventor, Otto von Guericke, burgomaster of Magdeburg), are loosely placed one upon the other, as in the figure: the lower communicates by a tube, in which is a stop-cock (open for the present), with the exhausting apparatus of an air-pump. At present there is no impediment to lifting the upper from the lower except its weight, the pressure of the air from within counterbalancing that from without. But if the air be withdrawn from the interior, and the stop-cock closed so that the apparatus can be unscrewed from the air-pump without allowing the air to enter, it will require an enormous force to separate the two hemispheres. If the diameter of the circle be 14 inches, the least force that will separate them will be equivalent to about half a ton. It has been found that the density



or volume of any gas is inversely proportional to its pressure or elastic force. This law (called Boyle and Mariotte's law, from the name of the discoverers) is only approximately true for many gases, but perfectly exact for air. From this law it will be seen that since water is 773 times heavier than air, the density of air under a pressure of 773 atmospheres would be equal to that of water.

Air, like all gases, expands uniformly with every increase of temperature. The coefficient of expansion has been found to be $\frac{1}{273}$ for every degree CENTIGRADE. Thus 273 volumes of air at 0° C. become 274 at 1° C., and 297 at 240° C.

In this article some only of the chemical and mechanical properties of air have been considered. Other details are given under **ACOUSTICS**, **AIR-GUN**, **AIR-PUMP**, **ATMOSPHERE**, **COMBUSTION**, **PNEUMATICS**, **RESPIRATION**, **VENTILATION**.

AIR, in music, a tune; that is to say, a melody of strongly-marked rhythm. "The sweetest airs in music are made by a kind of felicity, and not by rule" (Lord Bacon). The air in concerted vocal pieces was formerly always given to the tenor; it is now generally given to the highest part. See **ARIA**, **MELODY**.

AIR or **ASSEN**, a country of Central Africa, situated between 15° and 19° N. lat., and 6° and 10° E. lon. The northern portion has extensive mountain ranges from 4000 to 5000 feet high, with fertile valleys. Good pasturage is afforded for camels and cattle. In the desert regions the lion and other wild animals are met with. The rain-fall is abundant, though there are no permanent rivers, and wells are extensively used. South of this territory lies a bare dry plateau, 2000 feet above the sea, and still further south is the fertile Damerghu district, whence the chief food supply is derived. Clothing is imported. The soil is but little tilled, and that principally by slaves, but produces the date-palm, dates, and other fruits in abundance. The population, which is numerous, could scarcely be sustained except for the traffic in salt carried on between Bilma, a town in the Tebu country, lying east of Air, and the Hansa states of Sondan. The capital is AGADES. The inhabitants consist principally of three large tribes, some of whom are nomadic. The country received its name of Air on being conquered by the Berbers. Its climate is comparatively temperate, although in the tropics. (See Dr. Barth's "Travels in Central Africa," vol. i.)

AIR-BLADDER, a peculiar organ with which the great majority of fishes are provided, and by which they

are enabled to change the centre of gravity, or to adapt the specific gravity of their bodies to the varying pressures of the water at different depths. It is a hollow compressible sac, sometimes simple, as in the common perch, sometimes divided into two or more compartments by a lateral or transverse ligature, as in the trout and salmon, and at other times furnished with appendages more or less numerous, according to the particular species. The coats of most air-bladders are, a very fine internal one, containing crystalline bodies, and a thicker outer one of a fibrous texture, yielding isinglass.

The air-bladder is wanting in Chondropterygii [see Fishes], but present in Ganoidi, in which it acts also more or less as a respiratory organ. In Teleostei its presence is irregular, and its modifications are infinitely varied in different genera and species, but in this sub-class it has no respiratory function. In Cyclostomata and Lepidocardi it is wanting. The gas contained in the air-bladder of most fresh-water fishes consists of nitrogen, with a small quantity of oxygen; but in sea-fishes it is mainly composed of oxygen, often amounting to as much as 87 per cent. In all very young fishes there is a fine tube leading from the air-bladder either into the gullet or the region of the intestines, but in the adult form this is closed up in very many cases, and has become a mere ligament. This open tube in adult fishes is called the *pneumatic duct*; it occurs in the Ganoidi, and in one order only of the Teleostei, viz. the Physostomi.

In general all fishes which enjoy great powers of locomotion, and have occasion to pass through various degrees of pressure in their rapid transitions from the surface to the bottom of the ocean, are provided with this important organ; and so indispensable is it in their economy that those which, for the sake of experiment, have been deprived of it have sunk helpless to the bottom, and there remained incapable of moving or even of maintaining their equilibrium. But to fishes whose habits and organization confine them either to the surface of the water or to the bottom of the sea, and which therefore do not require to pass through different depths, or to encounter different degrees of pressure, the possession of an air-bladder is by no means so essentially requisite. Accordingly we find that all the different species of "rays" and "flat fishes" (such as skates, soles, turbot, brills), which live only upon the coasts and sand-banks at the bottom of the ocean, as well as the mackerel and others which find their food entirely at the surface, have no air-bladder; and so small is the relation of this otherwise important organ to the general conformation of fishes, that we sometimes find it present in one species and wanting altogether in another of the same genus.

Fishermen are well acquainted with the nature and functions of the air bladder, or, as they most commonly call it, the *swim*. They are accustomed to perforate this vessel with a fine needle in cod, and other species which require to be brought fresh to market, sometimes from a very great distance. By this operation the confined air is allowed to escape, and the fish constrained to remain quiet at the bottom of their well-boats, where they live for a very considerable period. Cod-sounds, which are brought in great quantities from Newfoundland, are nothing more than the salted air-bladders of these fishes. The Iceland fishermen, as well as those of America, prepare isinglass of a very excellent quality from cod-sounds. The Russians use the sound of the sturgeon for the same purpose. See ISINGLASS.

AIRDRIE, a parliamentary and municipal burgh and market town in the parish of New Monkland, Lanarkshire, about 11 miles east from Glasgow on the North British Railway. Not more than a century ago the only buildings were those connected with a farm, but the discovery of coal

and ironstone led to a very rapid rise. There are cotton and other manufactories in the town; and it has many fine buildings, such as the town-hall and the various places of worship. Airdrie possesses a free public library. It was the first town in Scotland to adopt the Act, and new buildings for the library were erected in 1880. In 1881 the population was 13,363.

AIRD'S MOSS or **AYRSMOSS**, a moorland tract in Ayrshire, the scene of a memorable skirmish, 22nd July, 1680, during the time of the persecution of the Covenanters. The Cameronians were defeated by a large force of military under Bruce of Earlshall, and Richard Cameron and his brother were slain. Hackston and Cargill were taken prisoners and afterwards executed. The event is commemorated by a monument.

AIRE, a tolerably well-built town of France, in the department of Pas de Calais, with a college, and 8500 inhabitants, is situated 9 miles S. by E. from St. Omer, at the confluence of the Laquette with the Lys, and at the junction of the St. Omer and Bassée canals, by means of which it communicates with the Aa and the Deule. The town is surrounded with ramparts and deep ditches; it has large barracks, a town-house, several handsome fountains, and two fine churches. Hats, woollen stuffs, yarn, soap, and oil are manufactured.

AIRE (*Vicus Julius*), an ancient episcopal city of Southern France in the department of Landes, stands on the slope of a hill on the left bank of the Adour, which is here crossed by a handsome stone bridge, 17 miles E. from St. Sever, and contains an ecclesiastical college, a very ancient church, and 5000 inhabitants. The town, which is neat and well built, is manufactures of hats and leather. It is a bishop's see, and was anciently important as the capital of the Visigoths.

AIRE, a river of Yorkshire, flowing into the Ouse, its chief tributary being the Calder. It is navigable for small vessels up to Leeds.

AIR-GUN, an instrument for projecting bullets, in which the moving power is the rush of condensed air allowed to escape, instead of the formation of gases arising from the ignition of gunpowder.

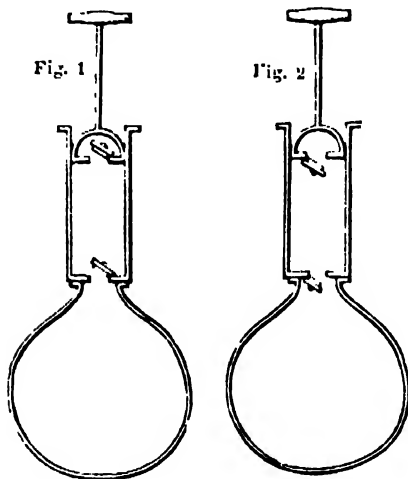
In the stock of the ordinary air gun is a condensing syringe, the piston of which compresses air into a cavity having a valve opening inwards, just behind the bullet. The bullet (which should just fit the barrel) is inserted in the usual way. The trigger opens the valve behind the bullet, and permits the rush of the condensed air from the cavity, which propels the bullet. The moment the finger is withdrawn from the trigger the air closes the valve, and remains somewhat less condensed than before for the next discharge.

In some air-guns the condensed air is contained in a hollow copper ball, which can be screwed on to the gun after condensation. The *air-cane* is so called because it is usually in the form of a walking-stick. The handle contains the condensed air, and can be unscrewed and filled by a separate condensing syringe.

No power, but only a convenient adaptation of power, is gained in an air-gun, since the condensation of the air requires force. The instrument has hitherto been little more than a toy.

AIR-PUMP, an apparatus for exhausting the air from a vessel. We shall also include under this head the converse apparatus for forcing more air into a vessel. The accompanying figures are sections of the simplest form of an *exhausting syringe* and of a *condensing syringe*. Both consist of a tube closed at one end, excepting an orifice to which a valve or lid is attached. A piston, with a rod and handle, enters at the other end, and can be moved up and down within the tube. The piston is not entirely closed, but has a valve opening the same way as the tube-valve.

Both are attached to the vessels, the air of which is to be rarefied or condensed. In fig. 1, or the exhausting syringe, every time that the piston is drawn *upwards* it leaves a comparative vacuum in the tube; and the air in the vessel passes up through the lower valve to fill up this vacuum. At the next downward movement the air thus raised is driven out of the instrument altogether, squeezed, as it were, till it escapes through the valve in the piston. The next upward movement allows the tube to fill again, but this time with air of less density, since a tubeful was taken out. And by repeated movements of this kind nearly all, but never *quite* all, the air may be drawn out of the receiver. In fig. 2, or the condensing syringe, all the operations are exactly reversed; the *downward* motion of the piston being the efficient agent in forcing into the receiver a quantity of air greater than that which it originally contained. The air-pump is but an application of the exhausting syringe. At the top is a metal plate ground to a perfect plane surface, on which is placed an inverted glass jar or receiver, whence the air is to be extracted. A hole in the plate is connected with a tube, which communicates with the pump barrel of an exhausting syringe. If there are two pump-barrels the pistons



are connected, by a rack and pinion movement, with a handle in such a way that when the handle is worked in semicircular movements the pistons are raised alternately. As the lower part of each barrel is connected with the receiver by means of the tube, the movements of the two pistons gradually draw out the air from the receiver in the manner of the exhausting syringe; and in this way a nearly perfect vacuum may be produced. The following experiments are among the most common of those shown with the air-pump:— 1. If the receiver be open at top, and the orifice stopped by the hand, on exhaustion the pressure of the exterior air will prevent the removal of the hand; or if a piece of bladder be tied tightly over the orifice, as the exhaustion proceeds the bladder will be pressed inwards, and will finally burst with a loud noise. 2. The weight of the air is proved by exhausting a copper ball furnished with a stop-cock, which is shut before the ball is removed from the air-pump. It will then be found to weigh less than before the exhaustion was made. 3. The presence of air in various substances may be detected. A glass of liquid placed under the receiver will give out bubbles of air as soon as the exhaustion begins. A shrivelled apple will be restored to apparent freshness by the expansion of the air which it contains; but will resume its original appearance when the air is allowed to return.

4. The elasticity of air may be shown by placing under the receiver a bladder not distended, the mouth of which is tied up. On exhausting the receiver the air contained in the bladder will expand it more and more as more of the pressure from the exterior is removed; and the bladder will finally burst from the interior pressure. If a hole be made in the smaller end of an egg placed under the receiver, the small bubble of air which always exists in the larger end will, by its expansion, force out the contents of the egg when the receiver is exhausted.

Torricelli produced the first vacuum, but Otto von Guericke made the first air-pump in 1654, and Boyle, Hawksbee, Gravesande, Cuthbertson, Smeaton, Sprengel, and others have improved it. In recent years a double-action air-pump has been invented which has two pistons in one barrel, and in which the air is drawn from the receiver in the centre of the barrel and discharged at both extremities. By this means a more complete vacuum is obtained, and the pressure inside the receiver can be reduced to less than $\frac{1}{1000}$ th of the pressure of the atmosphere.

In Sprengel's air-pump there are no valves, and its manner of working is exceedingly simple. Mercury flows in a continuous stream in one of the limbs of a T tube until it reaches the crossing; it then proceeds forward in a broken stream, or as a series of mercury plugs, each of which carries before it a small quantity of air coming from the remaining limb. If, therefore, a vessel be attached to this limb, and the joint be made air-tight, such a vessel will perform the function of a receiver, and will soon be nearly exhausted of air if the mercury be kept flowing. See fig. 3 annexed.

Cuthbertson's air-pump is given in Plate I., where A marks the hole in the receiver plate, B a stop-screw to admit air into receiver, T T the tubes, at the lower ends of which the tube from the receiver joins the pump-barrels; X is a cross bar to steady the barrels, K is one of the two working pistons, G G are the pressure gauges. On Plate II. representations are given of Hawksbee's (figs. 1 and 2) and Smeaton's (figs. 3 and 4) air-pumps, with sections of structure.

AIR-VESSELS or **AIR-CHAMBERS** are used in various machines, either to regulate and equalize the propulsion of fluids, as in a **FIRE-ENGINE**; or to regulate and check the velocity of apparatus which might otherwise attain a dangerous degree of speed. An example of the last-mentioned use is afforded by the contrivance employed by Mr. Timothy Bramah, instead of a fly-wheel, to regulate the speed of a tread-mill. In this contrivance the tread-

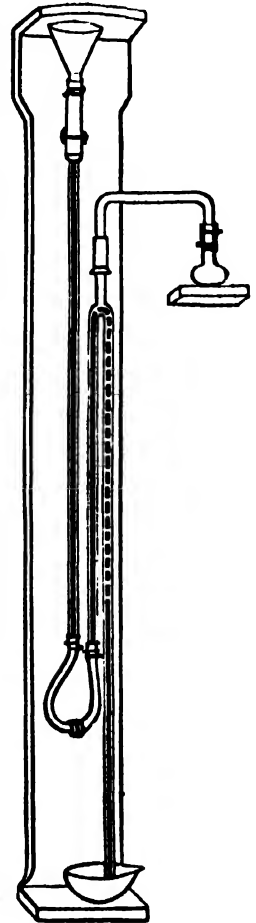


Fig. 3.—Sprengel's Pump at work.

wheel is made to work a series of large bellows, or air-vessels resembling bellows, in which the apertures for the ingress and egress of air are fitted with sliding plates worked by an apparatus resembling the governor of a steam engine; so that whenever the speed of the machinery exceeds the desired limit, the apertures are reduced, and a greater resistance is thereby occasioned.

AISLE, from the same root (*acala*, whence *axilla*) as the Latin *ala*, a wing. (Curtius.) The lateral divisions or passages of the interior of a church—those parts which lie between the flank walls and the piers, pillars, or columns which flank the nave, or grand central division—when the structure is so arranged, are called aisles.

AISNE, a department of France, formed out of portions of Picardy, Champagne, and Isle de France, is bounded N. by the department of Nord, E. by that of Ardennes, S.E. by that of Marne, S.W. by that of Seine-et-Marne, and W. by those of Oise and Somme. It lies between 48° 50' and 50° 4' N. lat., and between 2° 56' and 4° 12' E. lon. Its greatest length is 84 miles from N. to S., and its greatest breadth from E. to W. is 52 miles. The area of the department is 2813 square miles. The population in 1882 was 556,891.

The department consists of undulating plains, which are interrupted to the north by hills and valleys; the central and southern parts are crossed by chains of hills extending from E. to W. The soil is calcareous. In the N.E. chalk abounds with a mixture of clay-slate; in the S. millstone grit and plaster of Paris are met with. Iron ore, coal, peat, building stone, slate, flint, and potter's clay are found. The high plains are very fertile; the low grounds of the department are mostly wet and cold. Corn of all kinds, wine, hemp, flax, oil from beech mast, cider, and vegetables are the chief agricultural products. Horses, mules, asses, sheep, and horned cattle of an inferior breed are reared in great numbers. Its manufactures of lawn, linen, silk, calico, paper, leather, soap, glass, porcelain, and iron distinguish it as one of the most industrious districts in France. The climate is generally good, but in some parts fogs are frequent.

The Aisne, from which the department is named, rises in the Argonne hills, in the department of Meuse, crosses those of Marne, Ardennes, and Aisne, passing Sainte Menéhould, Vouzier, Rethel, and Soissons, and falls into the Oise about a mile and a half to N.E. of Compiègne, having run in a direction generally from E. to W. a course of 151 miles, of which the last 80 miles from Château-Porcien are navigable, and nearly 40 miles more above Château-Porcien are available for floating timber from the forests of Ardennes. Its feeders on the right are the Aire and the Vaux; on the left, the Suipe, the Vêle, and the Retourne, which are also available for purposes of floatage. The Sambre, the Scheldt (*l'Escaut*), and the Somme take their rise in the north of the department; the Oise crosses it from N.E. to W., passing Guise and La Fère, and is navigable from Channy, but is used for purposes of floatage almost from its source in Ardennes. The Ourcq rises in the south of the department, which it crosses from E. to W. on its way to join the Marne. The Marne also crosses the south of the department, passing through Château-Thierry, and is navigable.

The department is traversed by several excellent railways, among others by those leading from Paris to Liège and Mons. Besides its rivers and its roads, the department has means of communication with Belgium and the sea by the canals of St. Quentin and the Somme.

The area of the department is 1,800,000 acres, of which 180,000 are arable; there are 100,000 acres of natural grass land or downs, on which merino sheep are grazed; 25,000 acres are under vines, and 290,000 under woods.

The chief towns are Laon, Soissons, St. Quentin, Ver-

vins, and Château-Thierry, which give their names to the respective arrondissements in which they are situated.

AIX, a considerable town of France, in the department of the Bouches du Rhone, 478 miles S.S.E. of Paris, and 19 N. of Marseilles, is situated just to the north of the river Arc, in a plain surrounded with hills which produce good oil, wine, and fruit. Sextius Calvinus, having defeated the Salluvii, a Gallic tribe, founded a colony here about B.C. 120, and gave it, on account of its medicinal springs, the name of *Aque Sextiæ* (the waters of Sextius)—whence the name of Aix. The water is clear, light, and moderately warm, without much taste or smell, but is now in small repute for its virtues. In the middle ages this town was the residence of the counts of Provence. It still retains a part of its old wall and gates.

The streets of Aix are straight and well paved, and the public buildings handsome. Among them are the cathedral of St. Sauveur, which contains some good pictures; the palace; the museum; three fountains in the street called the *Cours*, on one of which is a statue, by David, of René, king of Provence; an old clock tower with movable figures; and the public library. Aix is the seat of an archbishopric, of a high court, and of some other public boards.

The population of Aix in 1882 was 29,000, who carry on a considerable trade in hardware and oil, for the latter of which the town is very famous. Among the manufactures are silks, velvets, woollen cloth, and painted calicoes.

AIX or AIX-LES-BAINS, a small town of France, in the department of Savoie (Savoie), 7 miles N. by E. of Chambéry. It owes its present importance to two hot springs, which annually attract a great number of visitors. Their temperature is 71 in 112° to 117° Fahr. In the time of the Romans it was called *Aque Allobrogum* and *Aque Gratiane* or *Domitiane*. The town stands in a pleasant and healthy valley, on the east side of the Lake Bourget, and at an elevation of 823 English feet above the level of the sea. The extensive *Établissement Thermal* contains baths, drinking and inhaling saloons. The space in front is adorned with a Roman triumphal arch, erected in the third or fourth century. There are also many other Roman remains. Population, 4500.

AIX-LA-CHAPELLE, called by the Germans *Aachen*, is the chief city of the district of the same name, in Rhenish Prussia, 75 miles E. by S. from Brussels, and 40 W. from Cologne. The situation of the city is agreeable; it stands on uneven ground, surrounded by hills of moderate elevation, generally covered with wood. Aix-la-Chapelle is the see of a bishop, and the seat of the courts of law, the chamber of commerce, and the custom-house of the district. There are many public buildings in the city deserving of notice, either for their antiquity or beauty. The old ramparts have been formed into promenades; and instead of being merely a quiet old city of great historical interest, it now possesses a large number of fine modern buildings, and has become a busy centre of manufacturing industry. The town-house is an old building in the Gothic style; in the "Coronation Hall" thirty-seven German emperors and eleven empresses were crowned, after which the ceremony took place at Frankfurt. The minster, which was commenced by Charlemagne, was built on the model of the Church of the Holy Sepulchre at Jerusalem; it contains the tomb of this monarch and a great number of relics, the chief of which are exhibited only once every seven years. There is a handsome theatre at Aix-la-Chapelle, a public library of 50,000 volumes, a polytechnic school, three hospitals, and other charitable foundations. The population in 1882 was 85,551.

The chief manufactures are woollen cloths, needles, pins, machinery, carriages, and chemicals; its industries have been much promoted by the coal which is found near the town, and have made it a place of great commercial

importance. Aix is a principal station of the Belgian Rhénish Railway, which has materially added to its commercial facilities.

The foundation of the first known town on this spot is generally assigned to Severus Cæsar, a commander among the Belgæ, under Hadrian, about A.D. 125. The remains found in modern times undoubtedly show that it was known to the Romans. The Emperor Karl (Charlemagne) is said to have resided there regularly after 768. He built a palace, a town-house, part of the present cathedral, and fitted up several baths. In the market-place is a fine spring, and a gilded bronze statue of the great Frank emperor, who did so much to beautify this place of his favourite residence. The fountain has a bronze basin 21 feet in circumference.

In 882 the Normans ravaged the city, which was again devastated in 1656 by a great fire. It was the scene of various religious contests in the sixteenth and seventeenth centuries. From 1794 to 1814 it belonged to France, during which time it was the capital of the department of the Rén.

Aix-la-Chapelle still attracts many visitors to its mineral waters. The word *Chapelle*, signifying chapel or church, has reference, it is supposed, to the cathedral which Kaiser Karl commenced in 773. The hot springs have a temperature of about 143° Fahr., and contain a large portion of sulphur; several bathing-houses are provided for the accommodation of strangers. That called the emperor's spring is the one most strongly impregnated with sulphur, and used by invalids. These waters, like others of the same kind, are used for bathing in, and are also drunk by invalids; they possess great virtues for the relief of gout and rheumatism. (Mouheim et Remond, "Analyse des Eaux Sulphureuses d'Aix-la-Chapelle.")

A short distance east of Aix-la-Chapelle, on the slope of a small hill, is the little town of Burscheid, with about 6000 inhabitants. It contains both hot and cold springs without any sulphur in them. The two hot springs have respectively a temperature of 158° and 127° Fahr. The hotter springs send forth such a copious stream of water that they form a considerable brook, called the Wurm Brook, which, passing through Aix, falls into the Ruhr.

Aix-la-Chapelle has a historical celebrity as the place of concluding some important treaties which bear its name. The first is that of 1698, between France and Spain, which terminated the war respecting the possession of the Spanish Netherlands (now Belgium), by which France gained and has retained Lille, Armentières, &c. The second was that of 1713, between England, France, Holland, Austria, Spain, Sardinia, and Modena, and terminated the war respecting the succession of Maria Theresa to the empire. The last was the Congress of 1814, which regulated the affairs of Europe after the restoration of the Bourbons in France. This congress began on the 30th September and ended on 21st November. The plenipotentiaries present were Wellington, Castlereagh, Nesselrode, Capo d'Istria, Richelieu, Hardenberg, and Bernstorff.

AJACCIO, the chief town of the island of Corsica (or *Corse*, as it is called by the French), and the capital of the department of Corse, is situated on the north coast of the Gulf of Ajaccio, on the western side of the island. It is sheltered by high mountains on the north and east. The port is spacious, and is protected by a fort. The town chiefly consists of two broad streets intersecting each other at right angles. It contains a college, a library of about 14,000 volumes, a botanical garden, and a school of hydrography. The population in 1862 was 11,000. Napoleon Bonaparte was born here, 15th August, 1769. The house is still to be seen. A noble statue was erected to him in 1859. Ajaccio is a bishop's see, and has a cathedral.

The climate is extremely mild in winter, and hot and dry in summer. The trade of Ajaccio is in oil and wine; there are also coral and anchovy fisheries.

AJAN', the name by which an almost unknown tract of the coast of East Africa is designated. It extends from near Magadoxo, which is included within the limits of Zanzibar, northwards to Cape Guardafui, a distance which may be roughly estimated at about eight degrees of latitude. The southern coast is sandy, barren, and low; but the northern is higher about Cape Delagua and Cape d'Orfui. Between these two capes there is a deep bay. D'Orfui has "a bluff point towards the sea, and is backed by lofty and singular-shaped mountains" (Salt). It is in 10° 30' N. lat., 51° 12' E. lon. Cape Guardafui, the most eastern part of Africa, is also a bold promontory with high mountains in the background; it is in 11° 50' N. lat., 51° 22' E. lon. No great river enters the sea on the coast of Ajan. The neighbourhood of d'Orfui is inhabited by a tribe of Somalis.

The name Azania, which occurs in the "Periplus of the Erythrean Sea," comprehends not only the modern Ajan, but the coast of Zanzibar as far as Quilon, provided this place be the Rhapta of the "Periplus."

AJAX, son of Telamon, king of Salamis, was one of the most renowned heroes of the Trojan War. According to Homer and Pindar, he was next in warlike prowess to his cousin Achilles. During his father's life Ajax led the forces of Salamis to Troy, in conjunction with the Athenians, as recorded in the *Iliad* (book 2, 558)—unless we admit the story that Pisistratus, in order to strengthen the claims of Athens to the possession of the island, interpolated the line. His chief exploits recorded in the *Iliad* are his duel with Hector in the 7th book, when the Trojan prince challenged any of the Greek army to single combat (one of the principal incidents in Shakspeare's "Troilus and Cressida"), and his obstinate defence of the ships in the protracted battle described in the 13th, 14th, 15th, 16th, and 17th books. After Achilles' death the armour of that hero was to be given as a prize to him who had deserved best of the Greeks. Ajax and Ulysses alone advanced their claims; but the assembled princes awarded the splendid prize to Ulysses. Ajax was so mortified at this that he went mad, and in his fury attacked the herds and flocks of the camp, mistaking them for the Grecian leaders, by whom he thought himself injured. On recovering his senses he slew himself. This catastrophe is the subject of the noble tragedy (Ajax) of Sophocles. The rivalry of the chiefs is related at length in the 14th book of Ovid's "Metamorphoses." Allusion is also made to it in the 11th *Odyssey*. The Greeks honoured him with a splendid funeral, and raised a vast tumulus on the promontory of Rheateum, corresponding in position with that of Achilles on the opposite promontory of Sigæum.

AJAX, son of Oileus, sometimes called the lesser Ajax, but not akin to Ajax the great, was remarkable for swiftness of foot and skill in using the bow and javelin. He fills a less important part in the *Iliad* than his namesake, though he is also distinguished. At the sack of Troy he offered violence to Cassandra in the temple of Pallas. Indignant at the profanation, the goddess raised a tempest which wrecked his vessel on its voyage home. Ajax escaped to a rock, and might have been preserved, but that he blasphemously defied the gods, and said he would escape in spite of them; whereupon Neptune cleft the rock with his trident, and he perished in the sea. (*Odyssey*, iv. 502.) Virgil relates his death differently. (*Æneid*, i. 39.)

AJMERE, a district of Rajputana, in British India, bounded by the state of Jodhpur or Marwar on the N.W., on the S. by Meywar, and on the E. by Jeypore and Kishangar. It lies between 25° 48' and 26° 42' N. lat., and 71° 22' and 75° 38' E. lon., and comprises the two

tracts known as Ajmere and Mhairwara. It is about 80 miles in length and 50 in breadth, and the area is 2057 square miles. The Aravalli range of mountains runs through the northern and western portions of the territory, while the remainder is comparatively level. Numerous sandy tracts prevail, and great scarcity of water is experienced, with the notable exception of the town of Ajmere. The only river worthy of the name is the Banas. The climate is healthy, with cold bracing weather in December, January, and February. The products are wheat and other cereals, rice, sugar-cane, cotton, and tobacco. Salt also is extracted from the saline matter in the soil. Cattle are generally scarce, but numbers of sheep are reared, and their wool forms a staple article of commerce. Trade is also carried on in cotton, bajra, opium, oil, and tobacco. The population in 1881 was 453,075. The district was formerly much more extensive, and at one time was the most powerful in India. The British took it from the Mahrattas in 1817. The natives consist principally of the Rajputs.

AJMERE, the capital of the above district, is a moderate-sized well-built town picturesquely situated on the slope of a high hill, overlooking a fertile valley, 220 miles S.W. of Delhi. On its summit is a remarkable fortress called Taragarh, which is a place of great strength, and is in most parts inaccessible; the town itself is surrounded by a stone wall. Just above the town is a large lake, which the emperors of Delhi formed by damming up the outlet of an extensive valley, into which a number of rills were conducted. The lake is 4 miles in circumference in dry weather, and 6 during the rains. It affords the means of irrigation to a large district on its banks, supplies abundance of excellent water to the inhabitants, and is full of fish. Sir Thomas Roe, ambassador of James I., visited Ajmere in 1615, and presented his credentials. In 1818 the city, with the surrounding district, was ceded to the British by Dowlat Rao Scindia, in exchange for a part of the territory of Malwa; it is now the seat of a British political agency. The town contains the tomb of Kwajuh, a famous Mohammedan saint, resorted to by pilgrims, as well as several mosques and temples. There are many fine residences, although the streets are mostly narrow and dirty. The modern town has a college, a medical school, and a mission station. Opium and salt constitute the principal articles of commerce. Oil making and the dyeing of cotton cloth of native manufacture are also carried on. The population in 1882 was 28,000.

AKBAR (*i.e. the Great*), the son of the Mogul emperor Humayun, was born on the 14th of October, 1542, at Amerkote, in the great sandy desert east of the Indus; and on the death of his father succeeded him in the government of Delhi, in the fourteenth year of his age (15th February, 1556). From this time till his death in 1605 he was almost continually occupied with enemies abroad or in repressing revolutionary movements at home, several of the rebellions having been headed by his brothers and sons. Akbar, nevertheless, found time to cultivate the arts of peace, and devoted his attention with the utmost anxiety to whatever appeared calculated to promote the happiness of his empire. The mildness of his character, his strict impartiality to the different classes of his subjects, the magnanimity which he showed to his enemies, and his great personal courage, are mentioned with praise even by the Jesuits who visited India during his reign; and the memory of his many amiable virtues still survives among the Hindu as well as the Mohammedan population of India. He encouraged trade and commerce, reduced taxation, and kept a strict watch over the conduct of the officers of his government. But what still more distinguished him was his spirit of toleration, a virtue seldom possessed by Mohammedan sovereigns, which led him to show the same benevolent attention

to the interests of all his subjects, whether they professed his own or the Hindu religion. In his endeavours to advance the prosperity of his empire Akbar was powerfully assisted by his celebrated vizir Abul Fazl, who, besides a memoir of Akbar's reign, wrote an excellent statistical and political account of the state of the Mogul empire during his administration, which is one of the most remarkable works in Oriental literature relative to India.

AKENSIDE, MARK, author of the "Pleasures of Imagination," a poem of some celebrity in the last century, written in blank verse, in the stilted style of the age. He was the son of a butcher at Newcastle-upon-Tyne, and born 1721. His parents were Presbyterians, and intended to bring him up as a minister; but he soon turned his attention to the study of medicine, and after remaining three years in the Scottish capital went to Leyden, where he took the degree of M.D. in 1744. It should be mentioned to his honour that, having been assisted while he was destined for the ministry from certain funds set apart by the English dissenters for the education of their clergy, he repaid in after life the money which had been thus bestowed upon him. Having finally settled in London he acquired professional honours, but never obtained any large share of practice. He died in 1770.

AKERMAN (believed to be either the *Julia Alba* or *Tyras* of the Romans) is a fortified town in the Russian province of Bessarabia, situated near the outlet of the Dniester into the Black Sea. The town stands on a projecting point of land, and is defended by deep ditches and a thick wall, and commanded by a castle on an eminence. Its harbour, though not deep, is a good one, and the place has a considerable trade, chiefly in salt procured from Lakes in the vicinity. The inhabitants, numbering about 30,000, chiefly consist of Greeks, Armenians, and Jews.

AKYAB, a district in the division of Aracan, British Burmah, between 20° and 22° 29' N. lat., and between 92° 14' and 94° E. lon. It is bounded on the N. by the Chittagong district, on the S. by numerous straits and inlets, on the E. by the Yoma Mountains, and on the W. by the Bay of Bengal. Its area is 5,337 square miles, and the population, which has largely increased under British rule, in 1882 was 290,000, consisting mostly of Mohammedans. The country between the sea and the mountains is level. In the hilly region the three principal rivers, the Mayu, the Koladyne, and the Lamo, have their source. The forests contain a valuable supply of timber. Rice is the chief crop; buffaloes, bullocks, and other cattle are reared. The principal means of communication are by water. The climate is malarious.

AKYAB, a seaport and administrative headquarters of the above division and district, is situated at the mouth of the river Koladyne. Rice is the principal article of export, and so abundant is the supply that Akyab is called the granary of Aracan. It is the chief commercial town of the district of Akyab which was ceded to the British by the Burmese, under the treaty concluded February 24, 1826, at Yandaboo. The population in 1882 was 20,000.

ALABAMA, one of the southern states of North America, is bounded on the north by Tennessee, on the east by Georgia, on the south by Florida and the Gulf of Mexico, and on the west by Mississippi. It lies between 30° 10' and 35° N. lat., and between 85° and 88° 30' W. lon. It is 317 miles long from N. to S., and 174 wide from E. to W. The area is 50,722 square miles. The population in 1830 was only 308,977; in 1860 it was 964,201 (of whom 435,080 were slaves); and in 1880 it had increased to 1,262,341.

Surface and Products.—Alabama has a short coastline, including the Bay of Mobile, of about 60 miles. The Alleghany Mountains terminate in elevated hills in the

north-east part of Alabama; in the north, generally, the surface is broken and mountainous; in the middle it is hilly, with tracts of prairie land; in the south, from the Gulf of Mexico to 50 or 60 miles inland, it is low and level. The soil is generally excellent, except in the south, where it is sandy and barren; it rests on limestone, which frequently appears at the surface, and readily decomposes. There are several mineral springs in the state, some of which form fashionable health resorts. The forest trees in the middle and north of Alabama are post oak, white oak, black oak, hickory, poplar, cedar, pine, chestnut, and mulberry; in the south, pine, cypress, and loblolly. The climate in winter is severe, the thermometer frequently registering 14° Fahr. below freezing; in summer the heat is tempered by refreshing breezes from the Gulf of Mexico. The low lands of the south, and near the shoals of the Tennessee, are unhealthy, but the rest of the country is salubrious. Iron ore is found in various parts of the state, and coal is abundant on the Black Warrior river and the Cahawba river. Other mineral products are granite, slate, marble, and some gold. Alabama is one of the chief cotton-producing states of the Union; Indian corn, rice, wheat, oats, &c., are also cultivated. It has been estimated that the area of the Alabama coal fields is over 5000 square miles, and the seams are unusually thick. The supply of iron ore is also practically inexhaustible, and its value is much enhanced in consequence of its proximity to the coal beds.

Rivers.—The two principal rivers of Alabama are the Alabama and the Tombigbee, the streams of which unite 10 miles above the city of Mobile, and form the river of the same name. The Alabama is a large river, and is navigable for vessels drawing 6 feet of water 60 miles above its junction with the Tombigbee, to Claiborne, and has 4 or 5 feet for 150 miles further, to the mouth of the Cahawba; thence to the junction of the Coosa and Tallapoosa, of which it is formed, it has 3 feet in the shallowest places. The Tombigbee is navigable for small sailing vessels to St. Stephens, 150 miles, and for steamboats to Columbus in Mississippi state; its total length is 150 miles, and it is navigable for nearly the whole of its length. Its course is generally south, and it empties itself into Mobile Bay. The Tennessee flows through the northern part of the state. [See TENNESSEE.] The Tuscaloosa, or Black Warrior, is a large branch or affluent of the Tombigbee, and is navigable to the town of Tuscaloosa. The Chatahoochee forms a part of the eastern boundary of the state.

Little attention, comparatively speaking, has hitherto been paid to manufactures; but there are some cotton factories, saw and flour mills, turpentine distilleries, and tanneries in different parts of the state, and the manufacture of iron is now largely carried on.

Alabama enjoys great advantages for both foreign and internal commerce, her ports being open to the sea, through Mobile Bay, and having more than 1500 miles of steamboat navigation on her rivers, and more than 1800 miles of railway.

Alabama is divided into 65 counties, the capital being MONTGOMERY. The other chief towns are MOBILE, Tuscaloosa—the former capital, where there is a state university—Huntsville, and Selma.

History.—The name Alabama is Indian, and signifies "I have no rest"—said to have been the exclamation of a chief in allusion to its well-stocked hunting grounds. Deer and wild turkeys are still abundant in the woods, and aquatic food is plentiful. The famous exploring expedition of De Soto across the southern part of the present United States, about the year 1541, is believed to have been the first visit of the white man to the wilds of Alabama. De Soto met with fierce opposition from tribes

of savages, who appear to have been more populous and less rude than the northern aborigines. The houses of these people evinced less barbarism than many other Indian tribes. In 1702 Bienville, a Frenchman, built a fort on Mobile Bay. The present site of Mobile, however, was not occupied till nine years after. At the peace of 1763 Alabama, with all the French possessions E. of the Mississippi (except New Orleans), fell to the English. This state formed a part of Georgia until 1802; from this date it was included in Mississippi territory till 1817, when it was organized into a separate government, and admitted into the Union as a state in 1819. It joined the Southern Confederacy in 1861.

ALABAMA, THE, and the ALABAMA CLAIMS.

The *Alabama* was a vessel which obtained great notoriety during the American civil war, and was the cause of a long-standing difference between the United States and Great Britain. The vessel was built by the Messrs. Laird of Birkenhead, and sailed surreptitiously from the Mersey on the 31st of July, 1862, known then simply as "No. 290." She proceeded to Terceira, one of the Western Islands, where she was supplied with guns, coals, and stores from a vessel which had been sent from London to meet her, and was then taken in charge of by Captain Scummes and some officers, who named her the *Alabama*, and hoisted the Confederate flag. The crew consisted of about eighty men, and the armament of eight 32-pounders; and as the vessel had been built chiefly for speed and for the purpose of capturing defenceless merchant ships, her subsequent career in nearly every part of the world was most disastrous to the shipping of the Northern States. Several fast-sailing cruisers were sent after her, but she eluded all attempts at capture for nearly two years, in which time she had captured and burned sixty-five vessels, and destroyed property to the amount of at least 4,000,000 dollars. In June, 1864, however, she was sunk near Cherbourg, after about an hour's engagement with the United States steamer *Kearsage*. Altogether the career of the *Alabama* was quite unprecedented, and proved how much injury may be inflicted on a mercantile nation by means of a single vessel built almost entirely for speed. It was not so much by the amount of property destroyed, large as that was, as by the heavy insurance for war risks to which she subjected them, and still more by the difficulty she caused them in obtaining freights, that the *Alabama* inflicted the greatest injury on American shipowners. She effected all this without having ever once entered a Confederate port; and the Americans of all classes never forgave the English for having allowed her to escape, in spite of information which had been given to the government as to her character, but which it seems was not acted upon until too late, in consequence of the illness of Sir J. Harding, the queen's advocate. A convention agreed to by Lord Clarendon and Mr. Beverly Johnson, an American ambassador sent to England almost specially for the purpose in 1868, proposing to refer the whole matter to arbitration, was almost unanimously rejected by the American Senate—the general feeling in America being, that as a preliminary step the English must admit they were wrong in acknowledging the Confederates as belligerents at all. Another attempt to reopen negotiations on the matter in 1869 led to no result; but in 1871 a joint high commission was appointed to endeavour to put an end to the long-pending dispute. The commissioners met at Washington, and after several conferences a treaty was concluded which referred the decision of the question to a court of arbitration composed of five persons: namely, a representative from each of the two interested powers, and three members to be appointed—one by the King of Italy, a second by the president of the Swiss Confederation, and a third by the Emperor of Brazil. The material bases of

procedure were regulated by the treaty, and to the arbitrators, who were to assemble at Geneva, was left the task of thoroughly examining the American complaints. Added to this arrangement, in the treaty England expressed, in a friendly spirit, her regret at the escape of the *Alabama* and the acts she had committed. It was, of course, expected that the cause of dispute would now be settled in a manner satisfactory to the Americans; but for many months the matter was in a very critical position, in consequence of the American government bringing forward claims which the English could not admit. They wished the arbitrators to decide not only on the direct losses which had been sustained through the vessel (including the expense of sending their men-of-war to endeavour to capture her), but also on all the indirect losses—such as those arising from the transfer of the American commercial navy to the English flag, from the increased cost of insurance, and even for expenses incurred through the prolongation of the war. Endeavours were made in vain to induce the American government to withdraw these “indirect claims,” but they persistently refused. The British government, determined if possible to save the treaty, and establish the principle of arbitration, despatched their representatives and agent to Geneva at the time named—15th June, 1872—but would certainly have withdrawn had not the “indirect claims” been waived. Without, however, waiting to hear the English view of the matter at all, the arbitrators decided that these claims were such as they could not take cognisance of. They were accordingly withdrawn by the American agent, after consultation with his government, and the arbitration proceeded with. The judgment of the arbitrators was signed on 14th September, 1872, and it awarded 15,500,000 dollars (about £3,229,166) to the American government in final satisfaction of all claims, including interest.

AL'ABASTER, a white stone used for ornamental purposes. The name is derived from Alabastron, a town in Egypt, where there appears to have been a manufactory of small vessels or pots.

There are two kinds of alabaster: the one is a *carbonate* of lime, the other is *gypsum*, or *sulphate* of lime. It is easy to ascertain of which of the two kinds a vessel is composed, for carbonate of lime is hard, and effervesces if it be touched by a strong acid; but sulphate of lime does not effervesce, and is so soft that it may be scratched with the nail. The term alabaster is now generally applied to the softer stone. There were extensive quarries of this alabaster in Assyria, and specimens are found amongst the ruins, cut into cylinders and sculptured with figures and inscriptions. Thin sections are translucent, and advantage is taken of this property to make lamps which shed a soft and beautiful light. See *Gypsum*.

ALAGOAS, a province of Brazil, chiefly between lat. 9° and 12° S., lon. 35° and 37° W., having N. and W. the province of Pernambuco, S. the river San Francisco, and E. the Atlantic. It derives its name from the various intercommunicating lakes (*lagoas*) for which it is noted. The country is mountainous on the N.W., and low, marshy, and unhealthy on the coast. The chief products are sugar, cotton, mandioc or cassava, maize, rice, timber, and dye-woods. The area is 11,600 square miles, and population, 350,000. The town of Alagoas, formerly the capital, is situated on Lake Mangnaba, and has a population of 14,000.

ALAIS, a town of France in the department of Gard, standing at the foot of the Cevennes Mountains, on the river Gardon, and connected by rail with Nîmes, 25 miles distant. It is well built, has a tribunal of first instance and of commerce, and a college. It is the centre of a considerable trade in raw and dressed silk, and has manufactures of pottery, glass, vitriol, stockings, gloves, and especially

of ribbons. There are rich iron and coal mines, and extensive ironworks near the town, which have contributed greatly to its prosperity. Most of the coal used in the French navy at Toulon is raised in the neighbourhood of Alais. Louis XIII., in 1629, besieged and took the city. It adopted the Protestant cause, and suffered greatly in consequence. The population in 1882 was 16,000.

ALAND, an island which gives its name to a small archipelago at the entrance of the Gulf of Bothnia, consisting of this principal island, and a great number of smaller islands, of which about eighty are inhabited, and 200 uninhabited. The word Aland is properly written with a small cipher over the top of the A, and is pronounced Oland, which signifies the “Land of Rivers or Waters.”

The largest island is about 18 miles long and 14 wide. Although it is mountainous and the soil is thin, it bears the Scotch fir, spruce, and birch, grows barley and oats, and supports a hardy breed of cattle. The coasts are deeply indented, and offer several excellent ports, of which the best is Ytterås. In the vicinity Peter the Great, in 1714, gained the first Russian victory over the fleet of Sweden, by which country this group of islands was ceded to Russia in 1809. Aland acquired notoriety in 1854, in consequence of the total destruction of the strong fort of Bomarsund on the east coast, which would ultimately have made Russia as formidable in the Baltic as Sebastopol had done in the Black Sea. The inhabitants of the Aland Isles, chiefly of Swedish descent, are skilful seamen, fishermen, and pilots. The entire population is about 16,000.

ALARIC, one of the most eminent of those northern chiefs who successively overran Ital. during the decline of the western empire, and the first of them who gained possession of imperial Rome. He learned the art of war under the emperor of the East, Theodosius, who curbed the Goths by employing them in different parts of the empire, and recruited his armies from the youth of the nation. But on the death of Theodosius they threw off the yoke, and Alaric, born of one of the noblest families of the nation, was chosen by his countrymen as their leader. Under his guidance the West Goths (Visigoths) carried on a series of wars against both the empires of the East and the West, and at length he determined to make his way into the empire of the West, for the purpose of establishing a kingdom by conquest.

Early in the year 403 the Gothic army appeared before Milan, which was immediately evacuated by the Emperor Honorius. But in a subsequent battle near Verona Alaric was completely defeated by the Roman general Stilicho, and was compelled to retire from Italy.

After a few years Alaric renewed his design of establishing himself in Italy, and for the time he was bought off by a promise of 4000 lbs. weight of gold. While the West Goths were yet at the foot of the Alps, the cowardly and weak Honorius procured the assassination of Stilicho, the only man who could still have defended the empire. Those West Goths who were serving in the pay of the empire had left their wives and children in the Roman cities; they were all massacred at the same time. Alaric advanced to the very walls of Rome. An application for terms was made on the part of the Romans, with an intimation that if once they took up arms they would fight desperately. Alaric returned this pithy answer: “The closer hay is pressed the more easily it is cut.” He demanded all the wealth of Rome. The ambassadors asked what he would leave to the inhabitants? He answered, “Their lives.” He at length consented to retire on condition of receiving a heavy ransom. But Honorius, although he had taken no measures for the defence of his capital, constantly refused to ratify all the treaties by which it might have been saved. Alaric laid siege to Rome a second

time in 409. The imposing name of the Eternal City seemed to inspire the barbarian with involuntary respect, and after a short interval Honorius was reinstated on a powerless throne. A treacherous attack on the Goths at Ravenna, while the conferences were still open, exhausted the patience of Alaric. The city was a third time besieged; and Alaric entered at midnight on the 24th August, 410, when he gave the town up to be pillaged for six days, but with orders to his soldiers to be sparing of blood, to respect the honour of the women, and not to burn buildings dedicated to religion. He died a few months after, while besieging Cosenza in Calabria. His wife's brother, Ataulphus (Adolph), was chosen as his successor by the army. Ataulphus was a friend to peace, and wished for nothing beyond a settlement in the empire and the hand of Placidia, the sister of Honorius. He obtained both these objects, but in a short time was assassinated by one of his equerries.

AL'ARIC II., King of the West Goths, succeeded his father Eudes in the year 484 in the dominion over Northern Spain and Southern Gaul. He was a peaceful sovereign, and thence unpopular with his people, who were partial to war. He was an **ARIAN**, as most of his countrymen were; but he was a very tolerant man, as we see from the orthodox council of Agde, which he permitted to be held in the year 506. Clovis, the newly-baptized king of the Franks, having overthrown the last remnants of the Roman power in Gaul, coveted the fine countries west of the Loire, and declared war against Alaric, A.D. 507. In a pitched battle near Vouge, in the environs of Poitiers, Alaric's army was entirely defeated. He fled, but was overtaken and killed. A proof that Alaric was peaceful because he appreciated the blessings of peace, and that he was able to consolidate that peace by a regular system of legislation, is the code called **BREVIARIUM ALARICI ANIMI**.

ALASKA or **ALASKA**, the name formerly given to a peninsula projecting from the N.W. coast of North America into the Pacific Ocean, and with the Aleutian Islands separating the Kamtschatka Sea from the Pacific. The name has now been applied to the whole of the territory on the American continent which once belonged to Russia, but which was purchased by the United States, in 1867, for 5,000,000 dollars. It possesses an historical interest from the fact that it undoubtedly formed a link in that great chain which guided the Russians to the new world. In addition to the main territory, Alaska embraces a strip of sea-coast, about 50 miles in width, stretching down to British Columbia, as well as numerous adjacent islands. Its greatest breadth is 800 miles, and greatest length 1100; its area being over 570,000 square miles. The population in 1880 was 30,000. The climate of the northern portion of Alaska is excessively cold, while that of the central and south-western coast, owing to its moisture, is tolerably mild. The extensive mountain chain on the north-west side of North America is continued along the Pacific coast, and terminates in the Alaskan peninsula, being there clad with snow. The volcanic peaks of Mount St. Elias and Mount Fairweather, both over 14,000 feet, are in this range; and several others are found on the scattered and islands of the west. In the interior broken mountain ranges are also met with. The country is traversed by a splendid river, the Yukon or Kwichuk, with a course of 1500 miles, and yielding an abundance of salmon; north of this Alaska is covered with broad marshy plains. Cereal crops do not thrive on account of the cold and moisture, but the extensive forests and numerous fur-bearing animals form the source of a considerable revenue to the inhabitants. Coal, iron, and other minerals are met with, but have not been developed. Ice is exported in large quantities to San Francisco. The chief settlement is Sitka, formerly New Archangel, in the *Baranof* group of islands. It has a population of 1500,

and is the seat of the government and the residence of a Greek bishop.

A'LATE (*ala*, a wing) is a term in botany, used when the stalk or other part of a plant is furnished with a wing-like expansion.

ALB, a white linen vestment reaching to the feet, and bound at the waist by a girdle, worn by the priests of the Roman Catholic Church at all the more solemn acts of worship. It has also been adopted by some of the clergy of the Church of England.

AL'BA, a town of Italy, in the province of Cuneo, 30 miles from Turin, is situated in a fertile plain near the banks of the Tanaro, and contains 10,000 inhabitants. It is a bishop's see, and has a cathedral dating from 1486. A large trade in cattle is carried on. It is the ancient *Alba Pompeia*. The town has some splendid promenades lined with acacias.

AL'BA, or **ALVA**, **FERNANDO ALVAREZ DE TOLEDO, DUKE OF**, was born in 1508. He entered very young into the service of the emperor Charles V., was present at the battle of Pavia, at the siege of Tunis, and in the expedition to Algiers. He afterwards followed him to Hungary; but his reserved disposition, and the bent of his mind to politics, at first gave an unfavourable idea of his talents as a general. On the emperor wishing to know his opinion about attacking the Turks, he advised him rather to build them a golden bridge than offer them a decisive battle. Through his wise measures, however, the emperor obtained a complete victory over Frederick of Saxony at Mühlberg, where the elector was made prisoner, and Alba consequently commanded at the siege of Mentz.

About 1556 Pope Paul IV. deprived the house of Colonna of their estates. The French favoured the pope, and the duke was ordered by Philip II., who had succeeded Charles on the Spanish throne, to proceed to Italy against the united French and Papal army. He made himself master of the Campagna of Rome, with a determination to humble both the pope and the French; but, much against his advice, an honourable treaty of peace was concluded with the pope, and himself subjected to the humiliation of asking the pope's pardon.

About 1560 the Flemish provinces of Spain began to manifest symptoms of discontent. Philip, a bigoted Catholic, was determined to maintain the Roman religion in all its purity throughout his dominions. He attempted to destroy the liberty and privileges of the Netherlands, and establish the Inquisition at any hazard. When one of his ministers represented to him that if he did not abolish the inquisitorial edicts he exposed himself to the risk of losing the states, he answered, that he "would rather have no subjects at all than have heretics for his subjects." A rebellion was the result of this ungenerous policy. Alba undertook to quell it and was furnished with troops and money, and invested with unlimited powers. He set sail from Spain in 1567, and on his arrival at Brussels, the country which, under the mild and amiable regent Margaret of Parma, had been comparatively tranquil, soon became full of alarm. The Prince of Orange fled to Germany, and in vain urged the Counts of Egmont and Horn to do the same. Alba summoned a council of state to his house to consult about the best means of restoring tranquillity and repressing sedition. The two counts came as councillors, when Alba seized them, put them in prison, and afterwards executed them in the great square of Brussels, on the spot where their monument now stands. More than 30,000 persons sought refuge in the neighbouring countries.

The Prince of Orange collected an army and was desirous of giving battle to the Spaniards, but the duke avoided an engagement; and the patriot army was forced to disband. The pope sent Alba a consecrated hat and sword. He

returned to Antwerp to carry on the fortifications of the citadel. The works were soon finished, and in the middle of the fortress the duke caused his own statue in brass to be erected. This statue represented him in full armour, and at his feet a two-headed monster, referring allegorically to the nobility and the people. This insult to a nation was so revolting that it alienated even his friends; and his fall was hastened by the cruelty practised towards the inhabitants of Haarlem, where he caused more than 2000 persons to be executed after having led them to expect forgiveness if they surrendered. His health was also now in a weak state; the greater part of Holland had revolted, and proclaimed the Prince of Orange stadtholder; his armies had ceased to be invincible; and he requested to be recalled. In December, 1573, he published a general pardon, and left a country which he had rendered desolate; in which he had delivered into the hands of the executioners 18,000 victims, and kindled a war which raged for thirty-seven years, and cost Spain the blood of her best troops, immense treasures, and the final loss of some of her richest provinces. The first act of his successor's authority was to demolish his statue, so that nothing remained in Flanders after his departure but the memory of his cruelty.

Shortly after his arrival in Spain he was sent as a prisoner to his castle of Uceda for abetting his son in misconduct. Four years afterwards Henry II. of Portugal died, leaving no rightful heir. Philip II. of Spain put in a claim, which he enforced by the sword. Alba was now summoned from his retirement, and at the head of 12,000 men entered Portugal by Elvas. In two weeks he placed Philip in possession of the crown of Portugal; himself, as usual, retaining the lion's share of the plunder. Three years afterwards he died at Lisbon, in 1582, at the age of seventy-four.

The Duke of Alba was undoubtedly the ablest general of his age. He was principally distinguished for his skill and prudence in choosing his positions, and for his rigid enforcement of the strictest discipline in his army. Being at Cologne, and avoiding, as he always did, an engagement with the Dutch troops, the archbishop urged him to fight. "The object of a general," answered the duke, "is not to fight, but to conquer; he fights enough who obtains the victory." During a career of so many years' warfare he never lost a battle. Firmness, energy, and caution were united in the character of Alba; yet he was a bigot and a tyrant, and was guilty of the most unrelenting cruelty. His barbarities, however, had an effect that he did not anticipate, in that they aroused a spirit of resistance which resulted in the rise of the Dutch Republic.

ALBACETE, a province of Spain, was formed out of portions of New Castile and Murcia. Its boundaries are on the N. Cuença, on the S. Murcia, on the E. Alicante and Valencia, and on the W. Jaen and Ciudad Real; its area is 5970 square miles. The surface of the country is mountainous, some peaks having a height of 5000 feet; but it is by no means destitute of rich plains and valleys. Minerals abound; agriculture is in a prosperous condition; and cereals, wine, honey, and saffron are produced. The bulls reared in this province are in great demand for bull-fights, and its horses supply the Spanish cavalry. Hemp spinning, and the manufacture of coarse cloth, cutlery, and earthenware form the chief industries. Population, 280,000.

ALBACETE, capital of the above province, lies about 140 miles S.E. of Madrid, in a fertile plain. The town is well built, and has a large cattle market annually in September. The manufacture of cutlery, which has much decreased, formerly gave the title of "the Sheffield of Spain" to this place. An extensive trade in saffron and agricultural produce is carried on, and there is a station

on the railway from Madrid and Valencia. Population, 15,000.

ALBA LONGA, and **ALBAN MOUNTAINS** and **LAKE**. The range of the Alban Mountains rises out of the level of the Campagna, south-east of Rome: the whole is of volcanic origin. The original crater comprehends the whole circuit of the Alban Mountains, on the outer margin of which are the towns of Frascati and Velletri, and there are four other craters within this circuit. One of these craters is the Campo di Annibale, the margin of which, called Monte Cavo, rises 500 feet above the Campo. The summit of the Monte Cavo (Mons Albanus) is 3000 feet above the sea, and on this, the highest point of the Alban range, was seated the ancient Temple of Jupiter, where the Latin nations used to celebrate their annual festival. The last remains of this venerable monument of antiquity were used in the last century to make the garden wall of the monastery of the Passionists.

The view from this summit towards Rome and the sea comprehends the whole coast line from Terracina to Civita Vecchia, a distance of about 100 miles. The two lakes of Albano and Nemi lie almost immediately beneath the summit, and look like the glasses of a huge pair of spectacles. Both these lakes are the craters of extinct volcanoes. The whole of the Alban range is healthy, and in parts well cultivated and thickly inhabited. The nobility and gentry of Rome resort hither in the summer and autumn.

ALBA LONGA ("the long white city") was a considerable city anterior to Rome, and the centre of a confederation distinct from that of the Latins, but combined with it. (Niebuhr's "History of Rome," v. i.) The site of Alba was a long narrow ledge, which rises above the monastery of Palazzuola, and is reached by the steep ascent of Monte Cavo. This position explains the name Alba Longa. The modern village of Rocca di Papa, which is probably on the site of the Arx Albana, lies between Monte Cavo and another summit almost as high as Cavo. Alba was engaged in a war with Tullus Hostilius, king of Rome, to terminate which the famous combat of the Horatii and Curiatii was resorted to. (Livy, i. 25.) Owing, however, to some subsequent treachery of the Albans, the Roman king razed Alba to the ground, and removed the inhabitants to Rome, where they settled on the Caelian hill: this, at least, is Livy's narrative. The celebrated house or *gens* of the Julii was among those who referred their origin to Alba. Of old Alba no vestiges remain. On the banks of the Alban Lake is Castel Gandolfo, which was formerly a favourite summer residence of the popes, including Pius IX., and further on is the pretty town of Marino; at a short distance from the latter is the abbey of Grotto Ferrata, inhabited by Greek monks of the order of St. Basilus, and supposed to stand on the ruins of Cicero's Tusculan villa. Fine avenues of shady trees lead to these several places. The Alban Lake is 7 miles in circumference, and its surface is 918 feet above the level of the sea; the shore is high, lined with trees, and covered with gardens and orchards; the water is clear, and its depth 300 feet. An outlet, designed to prevent the sudden overflows of the lake, which threatened the plain below, was constructed by the Romans in the year 358 after the foundation of the city; and it remains unimpaired to this day. They made a tunnel in the mountain 6 feet high and about 4 feet in breadth, for the space of more than a mile, mostly through the solid rock. The water of this outlet flows into the Tiber below Rome by several streams.

ALBAN, SAINT, said to have been the first martyr for Christianity in Britain. Bede fixes his martyrdom about A.D. 286; Usher reckons it about 303. Offa, king of the Mercians, built a monastery in his honour, whence the modern town St. Albans.

ALBA'NI, a patrician Roman family, originally from the town of Urbino. One of its members, Cardinal Gian Francesco Albani, was raised to the Papal see in 1700, when he assumed the name of Clement XI. Since that time the Albani have been classed among the Roman princes, and have furnished the Church of Rome with a succession of cardinals, who have been in general men of taste and abilities, and have exercised considerable influence at the Papal court. Cardinal Alessandro Albani, in the last century, was known as a patron of the arts, to which he devoted his fortune. During the course of fifty years he enriched his villa outside the Porta Salaria with a magnificent collection of statues, marbles, and other precious objects of art, which rendered the Villa Albani one of the most interesting spots about Rome. When the French republican army invaded Rome in 1798 this villa was stripped of all its treasures. Cardinal Albani had shown himself averse to France, and had urged the pope to form a league with the other Italian states to oppose the French arms. The cardinal, however, escaped to Naples. After the death of Pius VI., Cardinal Albani repaired to the conclave at Venice which elected Pius VII., and soon after died at an advanced age.

ALBA'NI, FRANCESCO, was born at Bologna, 17th March, 1578, and was placed under the tuition of Denys Calvert to be instructed in painting. Guido Reni was studying at the same time under that master, and being more advanced in art than Albani, he was enabled to afford him effectual assistance in his studies. The two youths quitted Calvert and placed themselves under Ludovico Carracci, whose school began about this time to be conspicuous in Lombardy, and under that great master they pursued their studies with an emulation advantageous to both. Having made considerable proficiency, Guido proceeded to Rome, whither he was followed by Albani, whose talents soon excited attention in that metropolis of art. Annibale Carracci, brother of Ludovico, had been employed to ornament the chapel of San Diego, in the national church of the Spaniards, at Rome; but being disabled by illness he recommended Albani to continue the work, which he finished so successfully as to obtain universal applause. He afterwards painted several large pictures at Rome, Mantua, and Bologna; but it is on his small pictures that Albani's reputation is chiefly founded. He might have become a good colourist but for that anxious and elaborate mode of finishing which impairs the brilliancy of his tints, and gives his flesh the appearance of ivory. Albani died 10th October, 1660. (Malvasia, "Felsina Pittrice;" Passeri, "Vite de' Pittori," &c.)

ALBA'NI, MATHIAS, one of the great violin makers. He was a Tyrolean, born at Botzen in 1621, and died there in 1673. He was a pupil of the celebrated Stainer, and his violins are rather good for power than for quality. His son, also Mathias Albani, was a maker of higher class. He studied at Cremona under the famous Amati, and his best violins rival those of his teachers. His finest instruments are dated about 1700.

ALBA'NIA, a country of European Turkey, stretching along the coast of the Adriatic and Mediterranean Seas. The area is 13,000 square miles, and the population about 200,000.

Physical Geography.—Albania is bounded on the north-east, north, and north-west by Montenegro, Bosnia, and Servia; on the east by Bulgaria and Roumelia; westward by the Mediterranean Sea and the Adriatic; and on the south by Greece. The country nowhere extends more than 100 miles from the sea, and in the southern part not more than 80 miles.

Albania is a mountainous region; ridges intersected by deep ravines cover the southern part of the country; the northern part is not so well known, having been less

visited by travellers. The Acro-Ceraunian Mountains, now called Khimara, after running north-west nearly parallel to the coast, form a bold headland just at the entrance of the Adriatic. The rugged rocks, heaped one upon another, with their summits hidden in the clouds and their base washed by a sea continually agitated, were regarded with apprehension by ancient navigators. The hills of Zagori, running south-east near the frontier of Albania and Macedonia, have flat summits, spreading into extensive plains. A semicircular chain of lofty mountains, once known by the name of Scardus, and now called Gliobotin and Nissava Gora, incloses the basins of the Moroka and the Drin; and a continuation of it (in some parts 4000 feet above the level of the sea) runs southward, under the denominations of Tzumerka and Metzovo, uniting with the ancient Pindus.

The rivers of Albania are not of any great size or importance. They flow from the eastern frontier into the Adriatic or the Mediterranean. The Moroka and Paskola unite their streams, and pass through the Lake of Sentari into the Adriatic; the Black Drin and the White Drin also flow into the Adriatic. Further to the south we meet with the Skombi (ancient Genusus), the Beratina or Krevasta (ancient Apsus), the Boissava or Voissava, the Calamas (ancient Thyamis), the Acheron, and the Arta. The largest of the Albanian rivers, the White Drin, is about 150 miles long. The principal lakes are those of Sentari or Zenta; of Okhrida, the ancient Lake of Lychinitis; of Yanina, which has been confounded with the ancient Acherusia; and of Butrinto.

Productions and Industry.—The climate of Albania in the lower regions is nearly as warm as that of Italy, but droughts and sudden and violent north winds render it less agreeable. In the part which corresponds to the ancient Epirus the climate is colder than in Greece.

Among the natural productions may be mentioned many species of oak, as the *Quercus cerris*, with its broad indented leaves and large hairy-cupped acorn, affording timber of good size and quality, and the Valonia oak (*Quercus agrifolia*), the acorns of which are deeply set in thick scaly cups, which are used in dyeing, and supply an article of export from many parts of Turkey. Other trees are the chestnut, the plane, the cypress, the ash, the cedar, the pine, and the larch. The wild vine and the elder are also frequent on the mountains, and the woods and wastes nourish the Amphilocheian peach, the Arta nut, and the quince. The cultivated fruits are the olive, which might be rendered more productive by better care; the vine, the pomegranate, the orange, the lemon, the mulberry, and the fig. The agricultural produce consists of barley, oats, maize, and other grains, tobacco, and cotton; some portion of it is exported.

The horses are spirited and active, but not large; asses are also used. The oxen are ill-shaped and stunted; flocks of sheep and goats are numerous. The milk of the goats is made into cheese, a small quantity of which is exported, and their skins serve to hold wine (to which, however, they impart a strong flavour); the flesh of the kids is considered equal to lamb. The dogs are not unlike the true shepherd breed in England, but larger (being nearly as big as mastiffs), with sharper heads and more curled and bushy tails. Fowls are abundant. Among the wild beasts are the bear, the wolf, and the jackal. The lakes abound with water-fowl.

The agricultural skill of the Albanians is not great. Their plough is of simple construction, and in time of harvest they reap their corn, though with little skill, and never mow it. The business of sowing and reaping is left to the women and to the aged. The young men fell timber or dress the vines, nor are they averse to the occupation of shepherds, as it enables them to indulge that

idleness to which they are prone when not engaged in fighting.

The Albanians have few arts or manufactures. They export a considerable number of capotes, and also the embroidery on velvet, stuff, and cloth, for which the country is famous; but the latter is the work of the Greeks of Yanina, who are an industrious people, rather than of the Albanians. The physicians in large towns are Greeks, but the surgeons are commonly Albanians; their practice is, however, of a very inartificial and somewhat violent character.

The trade consists mainly in the exchange of natural productions for the manufactures of more refined nations. Oil, wool, wheat, maize, and tobacco are sent to Naples, or to the Ionian Islands and Malta; and sheep, goats, cattle, and horses, to the Ionian Islands. Coffee and sugar are imported from Trieste; knives, sword-blades, gun-barrels, glass, and paper, from Venice; gold and silver thread, for embroidery, from Vienna; French and German cloth, coarse and ill-dyed, from Leipzig; and caps and a few other articles from various parts. The want of ready means of communication is a great impediment to traffic. Goods are conveyed by pack-horses, four or five of which are attached to each other by cords, and guided by one man.

Inhabitants.—The Albanians are about 5½ feet high, muscular and straight in their persons. They have broad full chests, long necks, long oval faces, with prominent cheek bones, and flat raised foreheads, arched eyebrows, blue or hazel (rarely quite black) lively eyes, thin straight noses, thin but open nostrils, and small mouths, furnished with good teeth. Their complexions are white in youth, but get tinged or dusky in old age. They wear moustaches, but shave off the rest of the beard. The women are tall, strong, and not ill-looking, but their appearance indicates wretchedness, ill-usage, and hard work. They are not so early marriageable as the women in southern Greece, but they retain their good looks longer, and give birth to children at a more advanced period of life.

The dress of the better sort consists of an outer mantle, made of coarse woollen stuff, bordered and variously figured with red threads, which, falling loosely from the shoulders behind, reaches as low as the knees; of two vests (the rich sometimes adding a third), the outer one open, the inner laced in the middle and richly figured; of a broad sash or belt, with one or two pistols, the handles of which are often long, and curiously wrought with silver; of a coarse cotton shirt, the lower part descending from beneath the belt like a Highland kilt, with drawers of the same material; and of variously coloured stockings, or high socks, and sandals. They also wear a small red skull-cap, and metal greaves or coverings for the knees and ankles. The most remarkable part of an Albanian's dress, however, is the capote, or cloak, a coarse shaggy garment either of a gray or a white wool, or black horse-hair, with open sleeves and a square flap or cape behind, which serves sometimes for a hood. The richer Albanians often add to their dress a shawl tied on the head like a turban.

Although culpably negligent in regard to cleanliness, the Albanians are fond of ornaments. They wear silver chains round the neck with amulets, silver snuff-boxes, or watches with shagreen cases at the end; a kind of pen-case, also of silver; and they also carry silver-mounted pistols, when they can afford them.

The food of the Albanians consists of wheaten or barley bread, but principally of cakes of boiled or roasted maize; goat's-milk cheese, rice, butter, eggs, dried fish, vegetables, and a small proportion of animal food. Their beverage includes milk, coffee, wine, a distilled spirit called raki, and one or two Italian liqueurs.

Their habitations are for the most part very neat. The cottages have seldom more than one floor, and that of

mind, which is regularly swept, and is quite dry. The rooms are commonly two, one of which is appropriated to the store of maize in the stalk, and of grapes, which are sprinkled with salt. The fire is made on the floor, and as they have only a hole to serve as a chimney, it is not surprising that their apartments are smoky. Their furniture is very simple, and consistent with their mode of life. Their houses are detached, with a garden to each. Their villages have a green, with a large tree for holiday sports. On this green is the circular paved threshing-floor, where the corn is trodden out by horses, which are fastened by a cord to the post in the centre of the floor, and driven round, sometimes to the number of eight or nine abreast.

In their domestic life the Albanians have the character of treating their women very little better than cattle. Among their amusements dancing is one of the most common, the instrumental accompaniment being afforded by a kind of three-stringed guitar. It is in the narrow vales and barren mountains of the country that the Albanians show their true character, whether in customs, dress, or language.

The Albanian language, so far as philologists have been able to disentangle its primitive elements from the numerous corruptions and impurities which have crept into it at various periods from Byzantine, Latin, Turkish, Venetian, and Modern Greek sources, presents well-marked Indo-Germanic affinities. It is separated into two main dialects—the Guegue, spoken by the inhabitants of Albania proper and other Turkish provinces, and the Tosk, which is the language of Albanians settled in various parts of Greece, especially in Attica, Salamis, and several islands. (See Hahn's "Albanesische Studien" and Viscount Strangford's "Letters," London, 1878.) It is therefore a fair hypothesis that this Albanian language is a relic of the primitive Aryan immigration before its division into the two streams which, flowing down into the Greek and Italian peninsulas respectively, developed into the Greek and Latin peoples and languages.

The Albanians—who are in reality only half-civilized mountaineers—are distinguished for their nationality, which is with them a far more powerful feeling than religion. Robbery, under varied forms, is almost a regular employment among them. They are proud of their prowess; indeed, the Albanians have always been of a warlike character. They were the soldiers of Pyrrhus, one of the most formidable opponents whom the Romans encountered; and under Scanderbeg they arrested for a while the tide of Turkish conquest. The Albanians, as might be expected from their imperfect civilization and their peculiar habits, are divided into tribes, each having its proper designation, and distinguished in some particulars from the adjacent tribes. Among these are the Guegues; the Mirdites, or Miridites, from whom Scanderbeg arose; the Lläpë; the Tosks, notorious for their poverty, dirt, and thievery; the Klimeuse, equally noted for their love of revenge; and the Tzani. The country is often full of anarchy—neighbouring villages, and even different divisions of the same village, being sometimes at deadly feud.

Albanian colonies are to be found in different parts of Turkey and Greece, especially in the ancient Attica, Bœotia, Argolis, Elis, and Laconia (in fact almost the whole of Attica, except Athens, is now inhabited by Albanians); but these are labourers. The warlike character of the nation is retained only by those who remain at home; and in the Morea the language is nearly lost, while in the Attic villages it is retained—these being probably colonies of later date. The people of Hydra are descended from Albanian colonists, but are scarcely distinguishable from their neighbours. But the most remarkable colonies are in Calabria and the Abruzzi.

History.—The Illyrians were probably the original stock

from which the Albanians sprung. Ptolemy mentions a tribe of *Albani* in this district, with a town called Albanopolis; but they appear to have been insignificant.

In the ninth and tenth centuries Albania was included in the great Bulgarian kingdom established south of the Danube, of which Tychinitis was the capital. In a subsequent period we find the Normans of Sicily and Tarento in permanent possession of some places on the coast. Durazzo was at once their depot and place of shelter. On the capture of Constantinople by the Franks, Albania fell into their hands, but the natives gradually shook off the yoke; and by the fourteenth century their power was so far increased as to lead them to attempt conquests distant from their mountains, but they could not retain their acquisitions. Some of their northern towns were taken by the Venetians, and the nation ultimately bowed to the supremacy of the Turks. The valour of the celebrated George Kastrioti (*i.e.* "of Kastri"), called by the Turks Iskander (Scanderbeg), could only delay the subjugation of his countrymen. He died in 1466 or 1467, and the Turks completed the conquest of Albania in 1478. The people, however, were never entirely subdued, nor does it appear probable that the sultan ever had more authority than at present, when he cannot appoint a governor who is not a native of the province. Under the treaty of Berlin of 1878, a portion of Albania, including the ports of Antivari and Dulcigno, was ceded to Montenegro; but the warlike character of the people caused very great difficulty in carrying out the treaty. Still further reductions of the country took place in 1881, when a large part of Southern Albania, including Thessaly, and comprising altogether an area of 5160 square miles, with a population of nearly 300,000, was, under a convention of the 21st May, 1881, transferred to Greece.

ALBANO, a town in Italy, about 15 miles from Rome, on the high road to Naples. It is situated near the Lake of Albano, at an elevation of 1200 feet, and is built on the site of the villas of Pompeius and Clodius, which the Emperor Domitian united into one. It consists chiefly of one long street, with several palaces of the Roman nobles; it is a bishop's see, and contains more than 6000 inhabitants. The lofty site and beautiful environs of Albano attract many visitors in summer, but the town is not entirely exempt from fever. The wines of Albano, praised by Horace, still maintain their ancient reputation.

AL'BANS, ST., an episcopal city, market town, and municipal borough in Hertfordshire, distant by the Midland Railway 20 miles from London, and connected also by branches with the North-western and Great Northern lines. It is situated close to the site of the ancient *Verulamium* or *Eboracium*, being separated from it by the small river Ver, a tributary of the Colne. Verulamium was probably at first a British town, and continued to be a principal Roman station while that people possessed this island. The Roman road, called by the Saxons the Watling Street, was also called Werlam Street, because it first went direct to Verulam, passing close under its walls, of which some very small remains still exist. Boadicea, queen of the Iceni, sacked and destroyed the town; and here an eminent citizen, Alban, is said to have suffered martyrdom in the persecution under Diocletian, A.D. 286, on Holmhurst Hill, where the abbey now stands. He is usually considered the first martyr to Christianity in Britain. In his honour a monastery for 100 Benedictine monks was erected in 793 by Offa, king of Mercia. The monastery became famous in the middle ages, the abbot having obtained from Pope Adrian IV.—a native of the town, and the only Englishman who has ever been pope—the right of precedence over all English abbots. After the insurrection of Wat Tyler many of the ringleaders were tried and executed at St. Albans. In 1213 King John held a parliament here.

An earthquake is said to have occurred in 1250. Two battles were fought during the Wars of the Roses, in 1455 and 1461, the former to the south-east of the town, and the latter on Bernard Heath, on the north side. In the first Henry VI. became captive; in the other he was set at liberty by his queen, Margaret of Anjou.

The town is well situated on the summit and southern declivity of a small hill, the abbey church being placed on the south side of the town, at the back of the High Street. The chief occupation of the inhabitants is the manufacture of straw plait, but there are also a silk mill, employing 800 hands, some breweries, and a small iron foundry. The principal buildings are the abbey, St. Michael's, St. Peter's, and St. Stephen's churches, built by Ulsinus on three principal roads leading from his monastery. In the latter parish there formerly stood an hospital for lepers. The Church of St. Michael contains the tomb of Lord Bacon, and a celebrated monument representing him in a sitting position. Amongst the other buildings are a market, corn exchange, dispensary, grammar-school, blue-coat school, public baths, and several well-endowed almshouses and charitable institutions. The town also possesses a clock-tower in the early perpendicular style, similar to those found in many continental cities, but the only one of the kind in England; it still contains the curfew bells. There were formerly three nunneries at St. Albans, in one of which—St. Mary Sopwell—it is said Henry VIII. married Anne Boleyn. Sir John Mandeville, a famous traveller in the middle ages, was a native of this place. At Gorbamby, 2 miles distant, is the seat of the Duke of Verulam.

The abbey church of St. Albans, which is part of the ancient abbey, was purchased by the inhabitants from Edward VI. for a parish church at the price of £400 and a free farm rent of £10, which last payment was, in 1684, redeemed for £200. The abbey itself had been granted by Henry VIII. to Sir Richard Lee, upon the suppression of the religious houses in that reign. The church is built in the form of a cross. It is in length more than 600 feet from E. to W., including a Lady Chapel at the east end; and the extreme breadth is more than 200 at the intersection of the transepts. From the intersection rises a heavy square tower, crowned by battlements. The vast extent and elevated site of the church give it an imposing appearance. Much of the masonry consists of Roman tiles from Verulam, flints, bricks, &c. The architecture affords specimens of the style of every age in succession, from the time of the Normans to that of Edward IV. The most central parts are the most ancient. The choir is separated from the nave by St. Cutlibert's screen. There is also a richly-carved screen in front of the altar; and a few remarkable monuments, including those of Humphrey, duke of Gloucester, and of the abbots Ramryge and Wethamsted. Here too is the largest monumental brass in England. The church suffered greatly during the parliamentary war, and for a long time it was sadly neglected. In fact, in 1871 it gave warning of imminent danger, and as the sum required to insure its safety was beyond the means of the townsmen, the county magnates recognized the urgency, and a sufficient amount was guaranteed to enable Sir Gilbert Scott to perform such work as was necessary to preserve the building. He stated, however, that it would require £46,000 to put the church into the condition in which it ought to be, and an appeal was made which was liberally responded to—the more liberally after it was resolved that the old church should be the cathedral of a new bishopric. The first bishop, whose jurisdiction extends over Essex and Hertfordshire, was enthroned in the abbey in 1877. The parliamentary borough was disfranchised for bribery in 1862. The population of the municipal borough in 1881 was 10,980.

AL'BANY, a district at the eastern extremity of the Cape of Good Hope, in South Africa. Its length from W. to E. is 70 miles, and its average width is about 25 miles. It was formerly inhabited by the tribe of Gbonaqua Hottentots; but the European settlers have long been in complete possession of the country. Population, 17,000.

The principal stream of the district, running along its northern boundary, is the Great Fish River, which rises in the Sneeuwbergen or Snowy Mountains. The chief towns are Graham Town, Bathurst, and Port Frances. A large natural salt-pan supplies the inhabitants of the colony with salt, and in the bays and inlets along the coast are excellent fish. The surface of the country is very varied; the northern portion affords good pasturage for sheep, which produce a valuable supply of wool. Cattle are also extensively reared, and a large trade in hides, horns, and ivory is carried on with the natives. There are a few manufactures in Albany, such as woollen hats, blankets, and candles; also tanneries, and numerous grist-mills.

ALBANY, the capital city of the state of New York. North America, stands on the west bank of the Hudson river, 145 miles by water from the city of New York. The population in 1830 was 24,238; in 1880 it had increased to 90,903. Albany is very advantageously as well as picturesquely situated, and has a large trade in timber, wool, corn, barley, and tobacco, as well as numerous manufactures. It has a fine river, navigable for vessels of 80 tons, with tide-water to Troy, 5 miles further, and possesses communication by the Erie and Champlain canals, as well as by various railways, with a wide extent of country. The Erie and Champlain canals unite at Watervliet, 8 miles above Albany, and the united stream flows into a capacious basin formed by a pier which extends $1\frac{1}{2}$ mile into the river, and forms a safe harbour. It is in population, wealth, and commerce, the second city in the state.

The town, which is somewhat irregularly built, rises rapidly from the flat bank of the river for half a mile, but beyond that the surface is level. The Capitol, where the legislative assembly is held, occupies a commanding situation at the top of State Street. The other public buildings are the City Hall and State Hall (both built of white marble), an academy, medical college, exchange, university, normal school, observatory, state library (containing 100,000 volumes), orphan asylum, and numerous churches, including a splendid Roman Catholic cathedral. Several daily and weekly newspapers are published, and there are many banking and commercial establishments.

Albany was originally a Dutch fort, erected in 1612 or 1614, called Fort Orange, and is therefore the oldest town in the United States except Jamestown, on the James River, which dates from 1607. Somewhat later it took the name of Williamstadt, which it retained till 1664, when the colony fell into the hands of the English. Its present name is derived from James II., to whom, when duke of York and Albany, Charles II. granted the proprietorship of the colony.

AL'BANY, LOUISA, COUNTESS OF, daughter of Prince Stolberg Gledern, in Germany, was born in 1753, and married in 1772 to Charles James Edward, called the young Pretender, grandson of James II. They resided at Rome, and kept a little court. In 1780 Louisa left her husband, who was much older than herself, and with whom she did not agree, and retired to a convent. She afterwards went to France; but upon her husband's death, in 1788, she returned to Italy, and lastly settled in Florence. She was then said to have secretly married Count Alfieri, the Italian poet, who died at her house in 1803. She, however, went by the name of Countess of Albany, as the widow of the last of the Stuarts, up to the time of her death, which happened at Florence in 1824. She was fond of literature and of the arts, and her house was

resorted to by the most distinguished persons at Florence, natives as well as foreigners. See ALFIERI.

ALBATEGN'US, the greatest astronomer of the Arabic school. The term Albategnius is the Latinized form of El Batain, or El Bateni, from Baten, in Mesopotamia, where he was born. He lived in the ninth and tenth centuries, beginning his astronomical observations in A.D. 877, and continuing them till his death in 929. He generally resided at Rakkah (Arat), or at Bagdad. His writings comprise original works on astronomy, &c., and abridgments of Ptolemy and Archimedes, with comments.

He was the first who rejected chords, and substituted sines in their place; and of this apparently trifling improvement we are reaping the fruits to this day. He also used versed sines and (though without seeing the full extent of their utility) tangents. He determined the obliquity of the ecliptic with the parallactic instrument within '03 of the truth. His sines gave trigonometry, even in his own hands, quite a new appearance and a new power; and he had a much greater number of methods in spherical trigonometry than the Greeks. He determined the length of the tropical year, making it only 2m. 26s. too short—a result much more exact than that of Ptolemy. The same may be said of his determinations of the precession of the equinoxes, of the place of the solar apogee, and of the eccentricity of the earth's orbit.

AL'BATROSS, one of the oceanic web-footed birds, Procellariidae, of which several species are known, included under the genus Diomedea. The Procellariidae belong to the order ANSERES. In the genus Diomedea the beak is powerful and large, with a concave sweep from the base, and rising gently towards the point, which is boldly and abruptly hooked; a furrow runs on each side of the upper mandible, from the base to the cutting edge of the terminal hook. In these furrows are the nostrils, standing out in the form of short tubes of horn, directed obliquely upwards. There are no toes behind; the three in front are webbed. The wings are very long and narrow. The great wandering albatross (*Diomedea exulans*) is one of the most remarkable of the feathered tribes that arrest the notice of the voyager in the Antarctic Ocean. Supported on its large wings, which in large specimens cover a space of fully 15 feet, it flies almost incessantly over the surface of the ocean, undaunted by the roughest weather. The albatross has been known to sail over the waves for more than an hour without the slightest movement of its wings being noticed. This power has been attributed by some naturalists to the presence of air-cells which can be inflated by the bird at will. The explanation given by Captain Hutton, as the result of his observations in his voyages in the Antarctic Ocean, seems, however, more probable. When the albatross is "sailing against the wind, the position of his wings, body, and tail, slanting a little downwards, is somewhat analogous to the sails of a ship close hauled, or, still better, to the position of a kite in the air, the momentum of the bird taking the place of the resistance of the water or the string of the kite. This momentum is entirely owing to impulses previously given to the air by means of his wings, and when, owing to the resistance of the air, it has decreased so much that he is no longer able to move with sufficient rapidity to prevent his falling, fresh impulses have to be given. For this reason albatrosses sail much longer in fine weather, rain especially soon destroying their momentum, and frequently obliging them to use their wings for propulsion. It is by combining, according to the laws of mechanics, this pressure of the air against his wings with the force of gravity, and by using his head and tail as bow and stern rudders, that the albatross is enabled to sail in any direction he pleases so long as the momentum lasts. If when sailing against the wind the inclination of his body is such

that the upward pressure of the wind against his wings and body just balances the force of gravity, his momentum alone acts, and he sails straight in the 'wind's eye.' If he wishes to ascend he inclines his body more to the horizon by means of his head and tail. If he wishes to turn to the right he bends his head and tail slightly upwards, at the same time raising his left side and wing and lowering the right in proportion to the sharpness of the curve he wishes to make, the wings being kept quite rigid the whole time."

The albatross is strictly oceanic in its habits, scarcely ever approaching the shores except in the breeding season, when it visits remote rocky islands. It varies in colour according to age and season, but is generally more or less tinged with gray above, the rest of the plumage being white. Like the petrels and puffins it discharges a quantity of fetid oily fluid through the nostrils when captured or molested, clattering at the same time with its beak. It is often taken by means of a line and baited hook.

ALBEMARLE SOUND, an inlet of the Atlantic Ocean, on the coast of North Carolina, United States, extending 60 miles inland. On account of its narrow width—from 1 to 15 feet—the water is almost entirely fresh. It communicates with Pamlico Sound and the ocean by several narrow inlets, and with Chesapeake Bay by a canal cut through Dismal Swamp. Albemarle is also the name of the largest of the Galapagos Islands.

ALBERONI, CARDINAL GIULIO, was born at Firenzuola in Parma, in May, 1664. He was bred to the church, and became curate of a country parish. The Duke of Vendôme, commanding the French army in Italy during the War of the Spanish Succession, 1702-1704, became acquainted with Alberoni, who rendered himself useful to the French general; and when Vendôme was recalled from Italy he took Alberoni with him into Spain, where the war was then raging in Catalonia. Alberoni was employed by Vendôme in his negotiations with the court of Philip V., and eventually succeeded in becoming the Duke of Parma at the court of Madrid, in which capacity he was instrumental in bringing about the marriage of Philip V. with Elizabeth Farnese, daughter of the Duke of Parma. The new queen (when Carlyle in his trenchant way nicknames the "tomnagant of Spain") in gratitude appointed Alberoni a member of the king's council, bishop of Malaga, and lastly prime minister of Spain. He now devoted all his energies to rouse Spain from the state of weakness into which she had fallen during the preceding century, and make her act a principal part in the affairs of Europe. He involved Europe in a new war at the bidding of his mistress, to carve out for her children principalities which otherwise she, as a second wife, could not secure for them.

His intrigues affected every European prince, the king of England included, for Alberoni supported the Pretender; but at length Philip V. was induced to write with his own hand an order for Alberoni's deposition, and his banishment from the Spanish territories. This happened at the end of 1719, after Alberoni had been minister about three years. Rejected by the countries whom he had injured, and that amount by nearly all Europe, he wandered in disguise until a new pope (Innocent XII.) restored him to his dignity of cardinal, and afforded him an asylum at Piacenza. Here, twelve years later, he died at the advanced age of eighty-eight.

ALBERT, Archduke of Austria, son of the Emperor Maximilian II., was made a cardinal and archbishop of Toledo. He was appointed by Philip II., in 1596, governor of the Low Countries. He resigned the cardinalship and married Elizabeth of Austria, daughter of Philip II., who brought him Flanders and Franche Comté as her dowry. In July, 1609, he fought the battle of Nieuport against the Dutch under Philip of Nassau, in which he was de-

feated. Albert next besieged Ostend, which he took after a long and murderous siege, in which 100,000 are said to have lost their lives on both sides. In 1609 Albert concluded a truce with the Dutch for twelve years, before the expiration of which he died, in 1621. He left no children, and the dominion of Flanders reverted to Spain.

ALBERT, Margrave of Brandenburg and first Duke of Prussia, was born in 1490. He was elected in 1511 grand master of the Teutonic order, who held dominion over Prussia proper, that part of the present kingdom of Prussia which borders on the Baltic Sea. At the conclusion of a war with Sigismund, king of Poland, a peace was agreed on in 1525 at Cracow, by which the duchy of Prussia was secured to himself and his descendants as a fief of the crown of Poland. Albert some time after embraced the Protestant faith, and married a princess of Denmark. One of his descendants, Frederick William, elector of Brandenburg, threw off the allegiance of Poland, and the son of this elector, Frederick I., changed the title of Duke into that of King of Prussia in 1701.

ALBERT DURER. See DURER.

ALBERT GOLD MEDAL was established by the Society of Arts in 1864 to reward distinguished merit in promoting arts, manufactures, and commerce; and the *Albert Medal* was instituted by her Majesty in 1866 to reward those who risk their lives in saving others from shipwreck.

ALBERT NYAN'ZA, an extensive fresh-water lake of Central Africa, about 140 miles in length and 40 in width. Its elevation above the sea level is 2720 feet, but nearly 1500 feet lower than the general surface of the country. Lofty cliffs fringe its eastern shores, while on the west rise the Blue Mountains, having an altitude of 7000 feet. The White Nile—here called the Somerset river—after leaving the Victoria Nyanza lake, about 80 miles distant, flows into the Albert Nyanza, and quits it at its north end as the true Nile. Mr. (afterwards Sir) Samuel Baker was the first European who explored this lake, although its existence was known to Speke under the name of the Little Luta Nzige. Large quantities of salt are found in the soil on the eastern coast, and this forms the chief article of trade. See NILE.

ALBERT (PRINCE) FRANCIS AUGUSTUS CHARLES EMANUEL, Prince Consort of England, by his first wife Princess Louise of Saxe-Gotha-Altenburg, was born at Rosenau Castle, about 4 miles from Coburg, on the 26th August, 1819. He was carefully educated by his father, who placed him, with his elder brother, under the care of privy councillor Florschütz, who continued to direct his studies after he had entered the University of Bonn. Here the prince diligently studied the subjects usually taught in a German university—giving special attention to the natural sciences, political economy, and philosophy. He also made great progress in music and painting, and cultivated his taste for poetry. While at Bonn he published, for the benefit of the poor of that place, a collection of songs, with music composed by his brother. He was an excellent gymnast, was fond of athletic exercises, and was in the habit of spending his vacation in pedestrian rambles through Switzerland and the north of Italy. In 1839 he visited England, and on the 23rd November of that year the queen summoned the privy council, and informed them of her intended marriage with her cousin. The prince was naturalized by an Act of Parliament, passed at the commencement of 1840, and on the 10th of February of that year was married to Queen Victoria, at the Chapel Royal, at St. James' Palace. Letters patent were issued on the 5th March, giving him precedence next to the queen, and an Act was passed on the 4th August, 1840, by which he was made regent in the event of the death of the Queen

before her next lineal descendant reached the age of eighteen years. At the time of his marriage he was also appointed a field-marshal.

As her husband and nearest friend it was his duty to advise the queen on matters of government, and in this he displayed great wisdom and prudence—his counsels on several occasions being signally useful and valuable to the nation. Perhaps, however, his greatest services were rendered in connection with social, scientific, and artistic matters, where he accomplished work of the very highest value. He was possessed of peculiar qualifications for dealing with these subjects, and laboured most earnestly to promote the well-being of the nation generally, and especially of the poorer classes. He promoted and encouraged the erection of model lodging-houses, public baths, industrial and other schools, and institutions designed for the furtherance of science, invention, and the fine arts. Shortly after his marriage he accepted the presidency of the Society of Arts, and it was owing to his suggestion that the Great Exhibition of 1851 was held. Its wonderful success was also largely owing to his energy, tact, and perseverance. In 1857 the formal title of Prince Consort was conferred upon him in order to settle difficulties as to precedence which had been raised at foreign courts.

He was an impressive and powerful public speaker, and his addresses were marked by profound thought and great breadth of view. In the management of his domestic affairs, and in the education of his children, his conduct was most exemplary, and the training of the Prince of Wales was carried out under his own superintendence, in accordance with a plan drawn up by himself, which is remarkable for the care and profound wisdom displayed.

During the earlier years of his life in England he had been regarded with a certain amount of distrust, but as the purity and benevolence of his character became known he was universally respected and beloved by all classes of society; and when, in the prime of life and in the midst of his usefulness, he was smitten down by typhoid fever the announcement caused universal consternation. The disease proved fatal on the night of 14th December, 1861, when the prince expired in the King's Room, at Windsor Castle, in the presence of the queen, Prince of Wales, and other members of the royal family. The mourning at his decease was universal, and deep sympathy was expressed for the bereaved queen by the whole nation; and a subscription, amounting to £50,000, was raised for the erection of a suitable memorial.

(See "Principal Speeches and Addresses of Prince Albert, with an Introduction," 1862; "Early Years of H.R.H. the Prince Consort," 1867; and "Life of the Prince Consort," by Sir Theodore Martin, in five vols., London, 1880.)

ALBERTUS MAGNUS, surnamed the Universal Doctor ("the most illustrious of the Schoolmen," says Dean Milman in "Latin Christianity"), was a member of the ancient noble house of Bollstadt, and was born at Laningen in Swabia in 1193. In 1211 he entered the order of Dominicans of Padua, where he was studying after having left Paris. During a long series of years he gave public lectures at Cologne, which were frequented by the principal scholars of the age; and he filled many places of trust and dignity. Three years, indeed, he was absent at Paris filling the chair of the Dominicans at the Jacobin convent there, with such glory that he was suspected of magic, since "God had never divulged so many of his secrets to one of his creatures," it was said. He was, however, unambitious of worldly honours, and he resigned even a bishopric which was forced upon him by the pope (after fulfilling the duties most conscientiously for three years), that he might enjoy the retirement of his cell, teach, and compose books. He died in 1280. His works form twenty-one volumes in folio, on logic, physics, metaphysics, alchemy, and theology.

A competent writer says of Albertus Magnus, "When his influence in promoting the progress of knowledge in Europe is taken into account, he being the first to present the students of the middle ages with an encyclopædia of knowledge, it is easy to enter into the feelings of those who bestowed upon him the name of Great. There are not many among those to whom that absurd epithet has been applied who have so well deserved it." Albertus quoted familiarly Latin, Greek, Arabic, and Jewish philosophers, and in addition studied natural history and philosophy.

ALBI or **ALBY**, a town in France, the capital of the department of Tarn, stands on a height on the left bank of the river Tarn, 400 miles S. of Paris, and 43 N.E. of Toulouse. It is the seat of an archbishop, has tribunals of first instance and of commerce, a college, several literary and scientific societies, a museum, and a library containing more than 12,000 volumes. The houses are of brick, but the streets are narrow and ill laid out. Among the public buildings the Gothic cathedral of Ste. Cécile is remarkable for boldness and elegance; the interior is adorned with old paintings, and some sculptures of extraordinary delicacy. It has one of the best organs in France. Albi possesses a fine promenade planted with trees, called La Lize, just outside the city, formed by a terrace, and commanding a view of the adjacent country. The number of inhabitants in 1882 was 18,000. They are engaged in the manufacture of linen and woollen goods, hardware, and macaroni. Iron, copper, and coal are found, and in the vicinity are the most extensive steel works in France. The surrounding country, formerly the district of Albigeois, is well wooded, and is fertile in corn, grapes, pears, and saffron; many sheep are fed, and a considerable trade is carried on in corn, dried fruits, and wine. The navigator La Perouse was a native of Albi.

The name Albigeois above mentioned is derived from the Latin form of the name of the town (*Albiga*), from which likewise, it is said, the early reformers of this part took the name of Albigenes. The town suffered severely during their persecution.

ALBIGENSES, a religious sect which appeared in the south of France in the twelfth century, and was the object of long and cruel persecutions and wars. They derived their name from the city of Albi, either because their doctrine was condemned at a council held there, or more probably because large numbers of them resided in that city or its neighbourhood. The denomination of Albigenes includes more than one sect, holding different opinions, but all agreed in considering the authority assumed by the popes in spiritual matters, as well as the discipline and ceremonies of the Roman Church, as unlawful and erroneous. They were a quiet and thrifty people, and trained their children in the principles of truth and uprightness. The charges of immorality which were at one time brought against them have been entirely disproved. Pope Innocent III. sent two legates, Peter of Castelnau and one Rainier or Raoul, both Cistercian or Bernardine monks, as his legates to France, in order to extirpate all these sects. Dominic, a Spaniard, and the founder of the order of preachers, returning from Rome in 1206, fell in with the legates, and volunteered his services in the same cause with them. In 1208 Peter of Castelnau, who had become odious by his severities, was murdered near Toulouse; and Innocent III. on this proclaimed a regular crusade against the Albigenes, and against Raymond VI., count of Toulouse, who supported them. All the French barons were summoned to take the field; and Simon, count of Montfort (the father of the great Earl of Leicester, the creator of the English Parliament), was appointed chief of the expedition, under the direction, however, of Arnald, abbot of the Cistercians and the pope's new legate. The war began

In 1209, and lasted many years, attended by circumstances of the greatest cruelty. As town after town was taken the inhabitants were slaughtered indiscriminately, the numerous ecclesiastics who were with the army being especially distinguished for their savage ferocity. Montfort lost his life at the siege of Toulouse in 1218, and Raymond, his adversary, died in 1222. The war, however, was resumed by the sons of the two antagonists; until Pope Honorius III., alarmed at the successes of Raymond VII., induced Louis VIII., king of France, to take the field in person. At last the Count of Toulouse, pressed on all sides, made peace with the king in 1229. This was a mortal blow to the Albigenes. Raymond himself died some years after; and in him the house of the counts of Toulouse became extinct, and its territories reverted to the French crown. The extermination of the Albigenes in the south of France was complete; the country was devastated; and the language and poetry of the Troubadours became also extinct. The best account of the Albigenes is found in the "General History of Languedoc," published at Paris in 1730. (Mosheim, "Ecclesiastical History," Thirteenth Century, part ii.)

ALB'INOS, a word applied by the Portuguese voyagers to the white negroes whom they found on the coast of Africa. The name is now used to designate any individual who exhibits peculiarities which are very generally styled *leucopathy*, among whatever race or in whatever country the variety may occur. The most striking peculiarities of albinos consist in the colour of their skin and of their hair and eyes.

Their skin is of a pearly whiteness, without any admixture whatever of a pink or a brown tint. It is often not soft and smooth in proportion to its whiteness, but rough, dry, and harsh. The whiteness of the hair always corresponds to the whiteness of the skin. Not only the hair of the head, but also that of the eyebrows, eyelashes, beard, and even the soft down that covers the external surface of the body, has the same unnatural whiteness.

With this whiteness of the skin and hair is connected a still more striking peculiarity, namely, a disagreeable redness of the eyes. That part of the eye called the iris is of a pale rose colour, from the absence of the colouring matter; in a word, the eye is exactly similar to that of the ferret. From this conformation of the eye a strong light cannot be borne. Even the full glare of day appears to excite some degree of uneasiness, and the eyes are generally weak, tender, and watery.

It would seem that there is a greater tendency to the formation of this variety in some parts of the world than in others. It is more common among the African and the Indian tribes than among the European people. It is common in both sexes, but it would appear to be somewhat more frequent in males than in females.

The immediate cause of the condition of the hair and skin is the absence of the ordinary deposit of colouring matter in the skin; the redness of the eye is owing to the absence of the colouring matter from certain membranes of the eye. The posterior surface of the iris, and the surface of the membrane of the eye termed the choroid coat, are both in the natural state covered with a dark-coloured pigment termed the *pigmentum nigrum*. The blood-vessels that enter into the composition of the iris and the choroid membrane are exceedingly numerous; but when the eye is natural these blood-vessels are concealed by the black pigment of which we have just spoken. When, however, this pigment is absent, there is nothing to conceal these vessels from the view; they are seen filled with red blood, and are so numerous as to give to these parts of the eye the appearance of intense redness. In the albino the colouring matter of the eye, like that of the skin, is wholly absent, and the eye appears intensely red, because the blood-vessels of the most highly vascular part of the organ

are left entirely naked and exposed to view. Of the cause of this peculiar affection of the organs in question we are wholly ignorant.

Some writers represent the peculiarities which distinguish the albinos as altogether the result of disease. But as far as can be judged from external appearance, and from their accounts of their own feelings, the white negroes appear perfectly healthy; and we know that European albinos exhibit not a single mark of any disease whatever. It is also certain that domestic animals which exhibit varieties perfectly analogous to those of the human albinos are free from disease, as is familiarly known with respect to the sheep, pig, horse, cow, dog, cat, rabbit, &c.

Albinism occurs in fishes, but the instances on record are very rare. A kind of intermediate stage is, however, not uncommon, in which the dark-coloured pigment cells become yellow. Among domesticated fish this "incipient albinism" is of frequent occurrence—gold-fish, for instance, being the abnormal variety of the crucian cup of China.

AL'BION. Great Britain and Ireland were known to the Romans by the general appellation of the *Britannic Islands*, but Great Britain was designated by the particular name of *Albion* or *Alwion*, and Ireland by that of *Ierne*, *Iouernia*, or *Erin*. Cæsar does not use the word *Albion*. His name for England is *Britannia*. Pliny says ("Hist. Nat." iv. 16), "the name of the island was *Albion*, the whole set of islands being called *Britannic*." The word *Albion* is still the only name by which the Gaels of Scotland designate that country; and the word signifies in the Gaelic language *white* or *fair island*. The word *alb* itself is not now in use in the Gaelic, but it is probably the same root that we find in the Latin adjective *alb-us*, and in the word "Alps." *Alb*, however, is found in Armstrong's Gaelic Dictionary. The termination *i*, *inn*, or *innis*, signifies "island."

The name of "*Albion*" was probably given to England by the Gaels of the opposite coast, who would be struck with the chalky cliffs that characterize the newest part of Kent.

ALBION, NEW. This name was given by Sir Francis Drake to the entire province of California and part of the adjoining north-west coast of North America, which he visited in the month of June, 1579. The part of this coast since known as New Albion was less extensive, and was limited by Humboldt and other geographers to that portion of the country which is situated on the mainland between 43° and 48° N. lat.

AL'BOIN, one of those northern princes who established kingdoms in Italy upon the ruins of the Roman empire. He was the son of Audoin, king of the Lombards, and succeeded his father in the year 561. Tracing their origin from Scandinavia, the Lombards were settled, at the time of which we speak, in Pannonia, the district now forming Eastern Austria. Here they became engaged in hostilities with the Gepidæ, who occupied Dacia, on the banks of the Danube; and in the early stage of this contest, Alboin, then a youth, signalized his courage, strength, and skill in arms, and the prince of the Gepidæ fell by his hand. His character, however, is marked by extreme ferocity. He obtained his wife Roxamond, sister of the prince of the Gepidæ he had slain, by a war with her father Cunimond, whom he also slew, and whose skull he converted into a drinking cup; and his successful invasion of Northern Italy, in 568, was marked with similar savageness. He fixed the seat of his new empire at Pavia, which remained for some ages the chief city of the Lombard dominions; and, by the justice and mildness of his government, secured the affections of his people. It is possible that, had not his reign been limited to the short space of three years and a half, he might have mastered the whole peninsula. The conquest of the Lombards was in some sort the epoch

of the regeneration of the people. Independent principalities, communities, and republics began to be formed on all sides; a principle of life was infused into the country which had been long buried in lethargic slumber. The series of monarchs who succeeded Alboin were long distinguished by their prudence, and by making the laws their rule of conduct. Alboin's life was terminated by domestic treachery. Having drunk deep at a feast with the chief of his countrymen, he ordered the skull of Cunimond to be carried to Rosamond, with his request that she would taste the wine, and rejoice with her departed father. The queen obeyed, but she determined on revenge, and caused him to be assassinated in his chamber by her paramour. This incident is the subject of a tragedy by Alfieri.

ALBO'RAK, the name of an imaginary animal of a shining whiteness, on which, according to the Moslem tradition, Mohammed performed his journey from the temple at Jerusalem through the heavens.

ALBORNOZ, ÆGIDIUS ALVAREZ CARRILLO, an eminent cardinal, was born at Cuenca about the beginning of the fourteenth century, and became archbishop of Toledo. In those days churchmen were sometimes warriors as well as politicians. Albornoz saved the life of his king, Alphonso XI, in an engagement with the Moors at Tarifa; was at the siege of Algeciras, and was made a knight by the king himself. Driven from Spain by his conscientious opposition to the criminal life of Peter the Cruel, he sought refuge in Avignon with Pope Clement VI., and was created a cardinal. In 1353 he was appointed legate, and intrusted with the important mission of the reconquest of the Papal states, a great task which he accomplished thoroughly. When Urban V. came to Italy, Albornoz went to meet him at Viterbo, and the pope called his legate to give him an account of the large sums intrusted to him for his campaign. The cardinal ordered a cart loaded with old keys and locks to be brought into the court of the house, and showing it to the pontiff, said, "I have spent all these funds in placing your Holiness in possession of all the towns and castles, the keys of which I here present to you." The pope, sensible of his ungrateful mistrust, embraced him cordially, and always after entertained for him the greatest esteem. Having been appointed legate of Bologna, he gave to that city a new constitution, and at his own expense founded there a college for the Spaniards. Cardinal Albornoz died at Viterbo in 1367, but was buried at Toledo, in accordance with his expressed wish.

ALBRECHTSBERGER, JOHANN G. (1736-1809), the greatest master of counterpoint of his day. He taught the immortal Beethoven. Hummel also was amongst his pupils. His great work on the subject is still an authority. It was translated into English by Sabilla Novello. His life was passed principally at Vienna, where he died, and in a village near to which he was born.

ALBUERA, a small Spanish village on the main road from Seville to Badajoz, at a distance of 16 miles S.S.E. of the latter. A battle was fought here on the 16th May, 1811, between the French under Marshal Soult and an allied force of British, Portuguese, and Spaniards under Marshal Beresford. The French were defeated, and retreated to Seville, but the battle cost the English nearly four-fifths of their number.

ALBUFERA, an Arabic word meaning "the water," is the name of several lagoons on the coast of Spain and Portugal. The most considerable of these is the Albufera de Valencia, which is 11 miles long and 4 broad. A tongue of land separates it from the sea, with which there is a communication by a small canal that can be opened and shut at pleasure. It abounds in wild fowl and fish, and

is a source of considerable revenue, at one time conferred by the crown on the Duke of Wellington.

AL'BUM (*album*, white) was a tablet on which the Roman prætors' edicts were written; it was put up in a public place. The word was also used to signify a list of any body of persons, as of the senators and of the judges.

A book which is intended to contain the signatures, or short verses, or other contributions of persons of note or supposed note, is now called an album. The name is also given to a book which is merely intended as a repository for drawings, prints, verses, and such matters; and of late it has come into very general use as describing a receptacle for photographic portraits.

ALBUMEN forms a constituent principle of plants and animals, and its essential properties are found to be the same from whichever kingdom of the organized world it is derived.

Vegetable albumen is found in the juices and seeds of plants. It is coagulable by heat; before coagulation it is soluble in cold water; after coagulation it is insoluble in water. It is insoluble in alcohol, sparingly soluble in acids, abundantly soluble in alkalies, and from the alkaline solutions it is precipitated by acids.

Albumen exists much more abundantly in animals than in plants. It forms a constituent both of the animal fluids and solids. In the animal fluids it forms an essential part of the serum of the blood; it abounds in the fluid that moistens the surface of the internal cavities of the body and of the organs they contain, and it exists in large quantity in the watery fluid poured out into those cavities in the disease termed dropsy. White of egg is nearly pure albumen: when liquid it soon putrefies, but if carefully dried it may be long preserved. In the animal solids albumen forms the principal part of the skin, of fibrin, the basis of muscle or flesh, and of the organs called glands.

The most remarkable property of albumen is its power of solidifying under circumstances which would rather tend to liquefy than to solidify most substances. White of egg shows white fibres at a temperature of 134° Fahr., solidifies at 160°, and becomes horny at 212°. When mixed with water a higher temperature is required for coagulation. Albumen is precipitated in white fibres by agitating white of egg with alcohol. Galvanic action will also coagulate albumen. Many of the stronger acids and salts will have the same effect; and so delicate a test of the presence of this substance is the bichloride of mercury, or, as it is commonly called, corrosive sublimate, that if a single drop of a saturated solution of it be let fall into water containing only the two-thousandth part of albumen, it will occasion a milkiness in the water, and produce a curdy precipitate.

Albumen furnishes ammonia when decomposed by heat; and from its property of coagulation it is useful in clarifying liquids, by entangling all the substances not held in solution, and bringing them to the surface.

The most interesting application of albumen is its employment as an antidote against one of the most virulent of the mineral poisons, viz., corrosive sublimate, or bichloride of mercury. For this poison albumen is a sure and effectual antidote. The world is indebted to Orfila, the celebrated Parisian toxicologist, for this discovery. It would seem, as the result of several experiments, that the white of one egg is required to render 4 grain of corrosive sublimate innocuous. The efficacy of this antidote has been fully established.

Albumen is very extensively used for photographic purposes, and its employment in this respect has of late years materially influenced the commercial value of eggs. It is manufactured on a large scale in Austria and Germany from the blood of animals, the albumen thus obtained being

used principally for mordanting yarns and cloth. Blood is dried in flat iron pans by exposure to air at a temperature from 100° to 112° Fahr. From 3000 lbs. of blood about 110 lbs. of albumen is obtained. The albumen from eggs is, however, preferred, although higher in price, for dyeing purposes, on account of its greater purity. Blood albumen of a second quality is largely used in the process of refining sugar.

ALBUMINOUS is a term in botany applied to some seeds. The date-stone may be taken as an example. At the further side from the furrow is a small depression, and by cutting through at this point the minute embryo (or young plant) will be found. The rest of the seed is composed of cells containing material to supply the embryo with food for growth when germination begins. Now, whenever a seed contains, in addition to and separate from the embryo, a mass of tissue with food-material, it is said to be *albuminous*. If, on the other hand, the seed has all the food-material stored up in the seed-leaves (*cotyledons*), as in the bean, thus consisting only of the embryo and the testa (or skin), it is said to be *exalbuminous*. The term was originally employed because it was supposed that the food-material was albumen, but it has been found that its composition greatly varies.

ALBUQUERQUE, ALFONSO (or, as the Portuguese write his name, *Afonso Albuquerque*), the greatest of those captains who built the short-lived fabric of Portuguese empire in India, was born near Achandea, in Portugal, in 1453. He was the second son of Gonzalvo d'Albuquerque, lord of Villaverde, descendant of a bastard branch of the royal family of Portugal. In his youth he served as esquire to King John II.; but he first becomes well known to us in the year 1503, when, in conjunction with Francisco Albuquerque, his cousin or uncle, he conducted a fleet to India, and secured the King of Cochin on his throne, which had been endangered by his powerful neighbour the Zamorin of Calicut. In gratitude for their services they obtained leave to build a fort at Cochin, which, according to the Portuguese authors, is to be considered as the foundation of their national empire in the East. Francisco Albuquerque was wrecked on his voyage home. Alfonso reached Lisbon safely, 16th July, 1504, and was favourably received by the king, who sent him out to India again, in 1506, in command of a squadron of five ships, composing part of a fleet of sixteen, under the orders of Tristan da Cunha. For a time the generals carried on a prosperous warfare against the Moorish cities on the eastern coast of Africa; and Albuquerque, being left in command, succeeded in taking the town and island of Ormuz, in the Persian Gulf, but was afterwards compelled to abandon it.

Being joined by three ships bound to India, he set sail for the Malabar coast in 1508. He had received a secret commission, authorizing him to supersede Don Francisco d'Almeida, governor of the Indies, when the period of his commission should have expired. On arriving at Cananor he informed Almeida of this; but the governor declined to surrender the government, and threw him into prison, where he remained three months. The arrival of the Grand Marshal of Portugal, with a powerful fleet, restored him to liberty. Almeida returned home, and Albuquerque was acknowledged general and commander-in-chief in India. After an unsuccessful attack upon Calicut in 1510, in which he was wounded, he took possession of the important town of Goa in the same year; and though compelled for a time to relinquish it he returned again, and taking it a second time it became the metropolis of Portuguese India. Early in the next year he meditated new conquest. A detachment of the fleet which had been sent out in the preceding year, was especially ordered to proceed to Malacca under the command of Diego de

Vasconcellos. This Albuquerque forcibly prevented, seizing Vasconcellos and sending him back to Portugal, and putting three of his officers to death. As soon as Vasconcellos was removed, Albuquerque sailed himself on the expedition against Malacca, which hitherto he had put off on different pretexts, and with some difficulty captured the town, which was given up to plunder. In this expedition his troops only amounted to 800 Portuguese and 200 Malabar auxiliaries; the Malayan prince is said to have had 30,000 men under arms.

Albuquerque had it much at heart to establish the Portuguese power as firmly at Malacca as at Goa. He built a citadel, coined money, established a new system of law and police, and lost no opportunity of conciliating the natives. After remaining at Malacca nearly a year he set sail for Goa, which in his absence was hard pressed by Idalean. After a shipwreck and some other vicissitudes, he arrived there 13th September, 1512. He was received with lively joy; his presence soon removed all cause for disquietude, and established the power of the Portuguese more firmly than ever. He relaxed the king's dues, and gave every encouragement to commerce, and Goa soon became the most flourishing city of the Portuguese dominions.

The orders of the court were still urgent to prosecute the war in the Red Sea; and seeing India quiet, he now, in 1513, directed his efforts to the reduction of Aden. His force, much larger than usual, consisted of twenty ships, 1000 Portuguese, and 400 Malabar troops (Barros, Decad. II. lib. vii. cap. 9); but he reaped neither honour nor profit by this voyage. Repulsed at Aden, he entered the Red Sea, leading the first European fleet that ever sailed in its waters; but he experienced much hardship and danger from heat, want, and difficulty of navigation, and returned to India without striking a blow.

His last enterprise was a second attempt upon Ormuz, in which he succeeded (1515) without recourse to arms, by the effects of terror and negotiation; and the place remained in the hands of the Portuguese till it was taken from them in 1662 by the English and Shah Abbas. Soon after the accomplishment of this favourite wish he fell sick, and was obliged to return to Goa. At the mouth of the gulf he met a vessel bearing despatches from Europe. They signified his recall, Lopez Soarez d'Albergaria being nominated his successor. His illness, aggravated by vexation, proved fatal. He died 16th December, 1515, in his sixty-third year. His body was conveyed to Goa, and buried in the Church of Our Lady, which he had built; and in after years—a touching testimony to the uprightness of his government—Moors and Indians repaired to his tomb, as to that of a father, to implore redress from the injustice and tyranny of his successors. His bones, more than fifty years after his death, were transported to Portugal.

ALBUE'NUM, in plants, is that part of the stem of dicotyledonous trees which timber merchants call *sapwood*. It is the newly-formed unchanged wood lying immediately below the bark, and is always of a very light colour. The upward course of the sap is principally through the albuminum. The *heartwood* or *duramen* differs in having the walls of the wood-cells considerably thickened and hardened.

While many plants have the albuminum and heartwood distinctly separated, in others, technically called white-wood trees, the duramen is scarcely developed. Hence all such trees are quickly perishable, and unfit for any but temporary purposes.

ALCÆUS, the earliest of the *Æolic* poets, and one of the most celebrated lyric poets of Greece. Only a few fragments of his poems remain. Several passages in the odes of Horace are manifest imitations, or nearly translations of some of these extant fragments. Alcæus was a native of Mitylene, in Lesbos, the contemporary and

fellow-countryman of the poetess Sappho. The chief events of his life belong to the period between B.C. 615 and 602, and relate to the political history of his native island. Of his life only one anecdote worth relating has been preserved: in a battle with the Athenians he threw away his armour (a mortal disgrace according to Greek notions of honour), and sought safety in flight. From Alcæus, the *alcæi*, one of the lyric metres of Horace, derives its name. The most striking fragment of Alcæus is one which has been finely expanded by Sir W. Jones. The fragments of Alcæus are collected in the "Cambridge Museum Criticum," vol. i. p. 421, and by Bergk, "Poetæ Lyrici Græci," Leipzig, 1848.

ALCAIDE or **ALCAÏDE**, a Spanish word formerly used to denote the governor of a fortress or a castle, and also the keeper of a gaol. It is derived from the Arabic *Al-Kayid*, "the head" or leader.

ALCALA', a name common in the southern parts of Spain, is derived from the Arabic *El-Calaat*, "the castle."

ALCALA' DE HENARES, a town of Spain, in New Castile, is situated in a fine plain on the river Nares or Henares, whence it derives its name, 18 miles E.N.E. of Madrid. The population is 9000. About a mile from its present situation stood the ancient Roman town *Complutum*, at the confluence of three small streams. This town was destroyed about the year 1000 of the Christian era. The present city was built in 1083, and surrounded with a strong wall. It is also called *Alcala de San Justo*, from the saint of this name who suffered martyrdom here. The Moors possessed it until the beginning of the twelfth century, when it was conquered by Don Bernardo, archbishop of Toledo. It was celebrated for its university, which was founded in 1510, and richly endowed by Cardinal Ximenes. It was in this university, and at the expense of its founder, that the Polyglot Bible, called the Complutensian Bible, was edited. At the distance of about a mile from the city stands a bridge over the river Henares, from which the towers and domes of thirty-eight churches and nineteen colleges present a magnificent appearance. The university was removed to Madrid in 1836. The cathedral is a fine Gothic building, and possesses several good paintings. In the college of St. Ildefonso is seen the sepulchre of Cardinal Ximenes, wrought in alabaster by Domenico Fiorentino. The environs of Alcala are pleasant and productive. Its climate is mild, but rather cold in winter. This city is the birthplace of Miguel Cervantes, author of "Don Quixote," and of Solis, the historian of America.

ALCALA LA REAL, a town of Spain, Andalusia, on the river Guadalquivir. The district around is productive in wine and fruits. It is 2700 feet above the level of the sea, and is the highest ground between the Guadalquivir and Grenada. Alcala has a fine abbey and an hospital. Its population is 12,000. It is 20 miles W.S.W. from Jaen. In 1810 the French defeated the Spaniards near this town.

ALCALDE, in Spain, is a judge appointed by the government, or elected by the towns, to administer justice within the district under his jurisdiction. The word is a corruption of the Arabic *el-cadi*, "the judge;" others derive it from the root *calede*, "to preside." There are several denominations of *alcaldes*. The *alcalde de alcaides* is a judge appointed by the government or the lord of the district, to whom the parties may appeal from the decision of the *alcaldes pedaneos*, or justices of the peace. The *alcaldes de casa y corte* is a bench of judges, who singly or jointly try all criminals within the court and 20 miles from it, or 60 in cases of robbery. The *alcalde mayor* is a judge appointed by the king or by the lord of the town to act as an assessor to the *alcaldes* or *corregidores*, who are not lawyers. The *alcaldes pedaneos* are elected by the

people yearly; they preside at the common council, or *ayuntamiento*, and act as magistrates. The parish officers are also called *alcaldes*, and are distinguished by appellations expressing their office. ("Diccionario de la Acad.," Garibay; Covarrubias.)

AL'CAMO, a city of Sicily, in the province of Trapani, 25 miles W.S.W. of Palermo, and within 3 miles of the Gulf of Castel-a-Mare. The town, which lies in a very fertile district, is mean and dirty, but possesses some fine old churches and palaces. Population, 20,000. An old poet of the twelfth century, Ciallo d'Alcamo, takes his name from this city. Near the town are the ruins of *Segesta*, and the remains of an ancient temple, the front of which is in good preservation.

ALCANTARA, a fortified town of Spain, in the province of Cáceres, on the southern bank of the Tagus, is 230 miles W. by S. from Madrid. The number of inhabitants is about 4500. Under the Romans, Alcantara bore the name of *Norba Cesarea*, and was distinguished by a beautiful bridge of six arches over the Tagus, built in the reign of Trajan, which, after having stood for seventeen centuries, was partly destroyed by the British in 1810, and by the Carlists in 1836, and is still in ruins. It was 670 feet long and 210 feet high. When the Arabians became masters of this part of the peninsula it was called *Al-Kantar-al-Seif* ("the Bridge of the Sword"), and hence the modern name. The town gave name to the military order of Alcantara, founded in 1156, of which it was the headquarters.

ALCANTARA, KNIGHTS OF ("la Caballeria de Alcantara"), a military and religious order of Spain, so called from the town or that name. It was originally called the order of San Julian, and owes its origin to two brothers, who about 1156, in the reign of Ferdinand II. of Leon and Galicia, assisted by a body of knights from Salamanca, seized a hermitage in this valley called San Julian del Pereyo, which they converted into a fortress as an outpost against the Moors; and the institution was confirmed by the pope, Alexander III., in 1177. When Alcantara was recovered from the Moors in 1213 by Alonzo IX. of Leon, the defence of it was soon transferred to the knights of San Julian, who shortly afterwards assumed the title of Alcantara. Thirty-seven masters in succession commanded the noble order of Alcantara; and like those of Calatrava and Santiago, they were at times almost too powerful for the monarchs of Spain. In 1494 or 1495 Ferdinand, the husband of Isabella, who had already assumed the command of the other two orders, prevailed upon Juan du Zuñiga, son of the Duke of Arévalo, to resign the grand-mastership of Alcantara. From that time the dignity has remained in the crown of Spain.

ALCARSIN and **ALCARGIN**. See CACODYL.

ALCE'DO. See KINGFISHER.

ALCESTER (formerly written *Alnecestre* and *Ellen-caster*), a parish and market town in Warwickshire, pleasantly situated at the confluence of the Arrow and the Alne, near the Worcestershire border. It is 110½ miles N.W. from London by the Midland Railway, and 16 miles W.S.W. from Warwick. Alcester is a place of great antiquity, and the name would indicate that it had been a Roman station—a supposition which is confirmed by the great numbers of Roman coins, urns, and other remains which have been found on the spot. Alcester has been generally supposed to be the *Alaia* of Richard of Cirencester. It stands on the old Roman way which was called the Ikenild Street. An abbey was founded here in 1140, about half a mile to the north of the town; it was surrounded by the Arrow on the north and east, and by a moat on the other two sides, and hence was called the Church of our Lady of the Isle. There are no remains now existing. Alcester contains many old houses, a fine

church of considerable antiquity, a handsome town-house, and a neat corn-exchange. It has also two stone bridges, one over the Arrow and the other over the Alno. A free school was founded here in 1594 by Walter Newport. It is the centre of the needle manufacturing industry; fish-hooks are also made. Edward Scriven, engraver, was born here in 1776. The population in 1881 was 5290.

ALCESTIS (*Ἀλkestis*), daughter of Pelias, and wife of Admetus, son of Phereus. Apollo having been befriended by Admetus at the time when he was compelled to serve as a shepherd on earth, granted him deliverance from death if at his appointed hour his father, mother, or wife would die in his stead. Alcestis offered herself, but Hercules, arriving at the moment of her death, wrestled with Thanatos (Death) for her soul, and brought her back alive from the tomb. The story of the devoted wife and of her deliverance is the subject of a fine tragedy by Euripides, produced B.C. 438. A noble English translation of the entire play is to be found in Robert Browning's "Rosalind."

AL'CHEMY. The name "chemics" (*χημία*, to pour) was invented by Alexander of Aphrodisia in the fourth century; afterwards the Arabic article "al" was added. Just as it was wrongly supposed to have been derived from "Cham" or "Chemo," the ancient name of Egypt.

The object of the alchemists was threefold—(1) to transmute the baser metals into gold by means of the philosophers' stone; (2) to discover a universal panacea for all the "ills that flesh is heir to;" (3) to discover the elixir vite, the drinking of which would confer everlasting youth and vigour.

In the opinion of the alchemists all the metals are compounds, the baser of them containing the same constituents as gold, but mixed with various impurities, which being removed the common metals would assume the properties of gold. The change was to be effected by *lapis philosophorum*, or the philosophers' stone, which is commonly mentioned as a red powder possessing a peculiar smell.

Alchemy probably had its origin among the Brahmins of India, who must have had some chemical knowledge to enable them to control their ordeals of fire and serpents. In Egypt alchemy, with the sister science astrology, was studied, and some works on it are attributed to Hermes Trismegistus. Thence the "sacred art" passed to the Greek philosophers, as Heraclitus and the celebrated author of the theory of atoms, Democritus. But the greatest name in alchemy is that of Geber, an Arabian who lived probably in the eighth century. He believed in the parallelism of the metals and the planets. Thus the sun represented gold; the moon, silver; Mercury, quicksilver; Mars, iron, &c. He undoubtedly laid the foundations of modern chemistry.

Quartus Avicenna, the inventor of soap, and Rhazes, a Persian, the next great alchemist was Albert Groot, usually called **ALBERTUS MAGNUS**, who was born at Lauingen in Swabia, in 1193. He imagined that the metals were composed of mercury and sulphur, and accounts for the diversity of them by the difference in the proportion of their constituents and purity. His writings are in general plain and intelligible. Thomas Aquinas is asserted to have been the pupil of Albert; he wrote three works on alchemy, which are obscure and often unintelligible. Raymond Lully, born at Majorca in 1235, was another alchemist who mixed up a good deal of chemical knowledge with the absurdities of his favourite art. About the same time lived Roger Bacon, who, notwithstanding his great learning and scientific attainments, was deeply imbedded with the mystery of alchemy. This is the more remarkable because he exposes the absurdity of believing in magic, necromancy, or charms. He believed that he had discovered the elixir of life in a solution of gold—gold dissolved in

aqua regia or nitro-hydrochloric acid. His chemical and alchemical writings amount to eighteen. See **BACON**, **ROGER**.

Basil Valentine, a German Benedictine monk, possessed very considerable merit as a chemical experimenter, and was much occupied in the preparation of chemical medicines. He first introduced antimony into medicine, and was well acquainted with the various preparations of it. He was of opinion that the metals are compounds of salt, sulphur, and mercury, and that the philosophers' stone was composed of the same ingredients.

Perhaps the most distinguished alchemist of all was Paracelsus, a native of Switzerland, who lived about the beginning of the sixteenth century. Following up the ideas of Basil Valentine, he thought there was only one elementary matter, which he considered the "alcalist" or universal solvent. In one of his works he declares that the search for gold is unworthy of the true alchemist, and adds—"True alchemy has but one aim and object—to extract the quintessence of things, and to prepare arcana, tinctures, and elixirs which may restore to man the health and soundness he has lost."

Even after the progress of chemical science had sufficiently demonstrated the errors of the alchemists, there were not found wanting many who still believed in the possibility of the transmutation of metals. Amongst these may be mentioned De Lisle, Woulfe, and Dr. Price.

As the philosophers' stone was said to take a great part in the pretended transmutations, Dr. Thomson endeavoured to discover its probable character. After quoting a description given by one of the alchemists, he states that this mysterious agent could hardly have been anything else than an *amalgam of gold*; and "there is no doubt," he adds, "that amalgam of gold, if projected into melted lead or tin, and afterwards cupellated, would leave a portion of gold; all the gold, of course, that existed previously in the amalgam. It might, therefore, have been employed by impostors to persuade the ignorant that it was really the philosophers' stone; but the alchemists, who prepared the amalgam, could not be ignorant that it contained gold."

Geoffroy published, in 1772, an account of the modes in which the alchemists deceived their too credulous dupes: by concealing small fragments, filings, dust, oxides, amalgams, or salts of gold or silver, in the vessels where the operations were carried on; so that gold or silver really appeared in the metallic form, though none but the experimenters knew the trick by which it was effected. Bergmann also explained many of the processes, but with much more faith in their genuineness than Geoffroy.

It is thought by some that the alchemists did injury to chemistry, by bringing it into disrepute; but Dr. Thomson remarks that a compensation was given in another way:—

"As the alchemists were assiduous workmen—as they mixed all the metals, salts, &c., with which they were acquainted, in various ways with each other, and subjected such mixtures to the action of heat in close vessels, their labours were occasionally repaid by the discovery of new substances, possessed of much greater activity than any with which they were previously acquainted. . . . Thus the alchemists, by their absurd pursuits, gradually formed a collection of facts, which led ultimately to the establishment of scientific chemistry." (Dufresnoy, "Histoire de la Philosophie Hermétique;" Hoefcr, "Histoire de la Chimie;" Kopp, "Geschichte der Chemie.")

ALCIBIADES, the son of Clinias, an Athenian of a rich and illustrious family, was born at Athens about 450 B.C. He became an orphan at an early age, and was brought up by his uncle Pericles. He soon gave evidence of his future greatness. Possessing a handsome person, great wealth, and distinguished relatives, he was speedily surrounded by a host of friends, and also of parasites and

flatterers. He enjoyed for a time the teaching of Socrates, who saw his talent, and to whom he was bound by close ties of friendship. His life was saved by Socrates at the battle of Potidea, and at Delium he in turn saved Socrates. Most unhappily he was unable rightly to enjoy his great position, and became notorious for wild dissipation, and for disregard of the national gods and religious beliefs of the people. His great intellectual power, undoubted courage, and lavish expenditure gratified the populace, however; while, owing to his family and connections, he also had great influence with the wealthy and powerful. He therefore soon came to the front in public affairs, and in 421 he defeated the ambassadors who had been sent by Sparta to conclude a peace, and who had made him their enemy by declining his assistance, and persuaded the Athenians to unite with the people of Argos against the Spartans. In 419 he was made *stratēgos*, or chief military officer of Athens, and during the next three years he took a prominent and active part in the intrigues and war carried on in Peloponnesus.

His ambition, however, needed a much wider field than this, and he soon succeeded in persuading his countrymen to undertake, in the first place, an expedition for the acquisition of Sicily. An Athenian fleet sailed from the Piræus B.C. 415, under the joint command of Nicias, Laches, and Alcibiades. Popular enthusiasm was strongly excited, and the conquest of Italy, of Carthage, and eventually of the hated Peloponnesus seemed to promise fair; but before Alcibiades had time to show what his abilities were he was recalled. It was usual to place a square block of stone, surmounted by a head of Mercury (Hermes), before the doors of temples and houses in Athens, and of these the greater part were defaced in one night. The act was believed to bode ill to the expedition to Sicily, then in preparation, and the enemies of Alcibiades endeavoured to connect him with the sacrilege. It is most probable he had nothing to do with it; but they succeeded in obtaining his recall, although when he offered, before starting, to stand his trial, he had been ordered to set off for Sicily. Alcibiades obeyed the summons, and quitted the fleet in his own trirème; but believing that his death was resolved on, he disappeared at Thurium in Italy, in company with other accused persons, and betook himself first to Argos and then to Sparta, where he revealed all the plans of the Athenians; and by his assistance the Spartans were enabled to gain important victories, and to obtain fresh alliances. He was condemned to death at Athens, and his property confiscated. He soon, however, became the object of suspicion, and instructions were sent to the Spartan general in Asia, in whose camp he then was, to have him assassinated. Being warned of this he left the Spartan camp and repaired to the Persian satrap, Tissaphernes (412 B.C.).

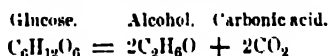
The exertions of Athens ever since the expedition to Sicily, which had ended in such utter disaster, had been wonderful, but they had nearly drained her treasury. Alcibiades now gave the Athenians hopes of an alliance with Persia, on condition of his own restoration. [See NICIAS.] His proposals were accepted, and he was recalled (411); but he did not at once return to Athens. The prospects of the Athenians soon brightened. At Cynossema (411) the Peloponnesian fleet was defeated by Alcibiades; at Abydos, in the same year, a further success was obtained; at Cyzicus (410) a still more brilliant victory was gained, in which every ship of the Peloponnesians was taken or destroyed. In the two following years Chalcædon, Byzantium, and the whole Hellespont and Propontis were regained to the alliance or subjection of Athens; and thus the control of the Euxine (Black Sea), and the power of levying duties on all ships passing the straits, was recovered. Alcibiades now led home his victorious armament in B.C. 407. He was

received with distinguished favour, and elected commander-in-chief.

After staying four months in Athens he returned to Asia. The Athenians are often bitterly blamed for superseding him almost at once, in consequence of a defeat at Notium, where his pilot gave battle during his absence, and contrary to his commands. But surely a general has no right to leave his forces in incompetent hands: or if he does he must take the consequences. Alcibiades retired from the fleet to the Thracian Chersonese, where he had large possessions. Here the history of his public life ends. He still resided in the Chersonese in 405, and endeavoured to prevent the defeat of Ægospotami, which he foresaw from the negligence and incompetence of the Athenian commander; but his advice was disregarded. Athens was taken by the Spartans in the following spring, and Alcibiades, thinking himself no longer safe in the Chersonese, retired into Bithynia. During his abode in Asia his house was set on fire by a body of armed men, probably emissaries of Sparta, and he himself was killed by a missile from the assassins. He appears to have died in 404, being then about forty-six years of age. (Thucydides; Plutarch, "Life of Alcibiades.")

ALCOHOL (C_2H_6O). hydrate of ethyl. This word is probably of Arabic origin, and is the popular name of what is sometimes termed *ardent spirit*. In chemistry the term alcohol is employed as a generic name for a class of bodies many of which, in their external characters, have little resemblance to common alcohol. All neutral compounds of carbon, hydrogen, and oxygen which react directly upon acids—that water is eliminated and ethers are produced, are now termed alcohols. Ethyl alcohol is the intoxicating principle of beer, wine, and fermented liquors in general; and when these liquors are subjected to distillation the alcohol and a considerable quantity of water are vaporized and condensed together. The distilled products have different names and properties according to the substances yielding them; thus, brandy is obtained from the fermented and distilled juice of the grape; rum from that of the sugar-cane; whisky, and what is termed spirit of wine, are usually obtained from barley, which is generally malted previously to fermentation.

Ordinary vinic alcohol is formed in the process of fermentation by the decomposition of grape sugar (glucose, $C_6H_{12}O_6$) into alcohol and carbonic acid, thus—



See FERMENTATION.

The alcohol of commerce, however, always contains much water, on account of the great affinity between them; and it is a difficult chemical process to produce absolute or pure alcohol, because at the boiling point of pure alcohol the vapour of water possesses a high tension. The most highly rectified spirit procured by fractional distillation contains about 10 per cent. of water. One method consists in placing common alcohol in a membranous vessel, of such a nature that water but not spirit will exude through it. Another method consists in separating the water by its affinity for chloride of calcium, leaving the spirit behind. Another method depends on the affinity of lime for water in a vacuum. But the method most usually practised on a large scale is to add a salt to the liquid, which has a great affinity for water, and little or none for spirit. Carbonate of potassium, chloride of calcium, and quicklime are commonly used.

Alcohol, in its absolute or anhydrous state (free from water), is a limpid, colourless liquid, having a very high refractive power, of an agreeable smell, and a hot pungent taste. Its specific gravity is 0.791 at 68° Fahr., or 0.7947 at 59° Fahr. It has never been frozen, but according to

Faraday becomes viscid when exposed to the low temperature produced by evaporation of carbonic acid and ether under an exhausted receiver. It boils at 78.4 C. (173.1 Fahr.) It is extremely volatile, producing considerable cold during evaporation; the degree of cold being proportional to its purity. Heat expands alcohol in a greater degree than it does water, for 100,000 volumes become 101,168 by being heated from 32° to 100° Fahr.; whereas an equal bulk of water heated to the same degree is increased only to 100,908. It is much used for filling thermometer tubes. Alcohol, and the vapour arising from it, are extremely inflammable; it burns with a lambent flame, the colour of which depends upon the strength of the alcohol; a blue tint prevails when it is strong, and a yellow when weak. Although the flame of alcohol yields but little light its heat is intense; it burns without any smoke. There are several substances which communicate colour to the flame of alcohol: boracic acid and salts of copper impart green, sodium and barium salts yellow, and the salts of strontium an intense and beautiful red colour. Absolute alcohol may be fired by the electric spark, which when passed through a mixture of the vapour of alcohol and oxygen gas causes it to take fire and explode violently. The vapour of alcohol requires three times its volume of oxygen gas to be perfectly burned, and it then yields water and twice its volume of carbonic acid gas. Alcohol vapour undergoes slow combustion when condensed together with oxygen upon the surface of certain metals. Platinum black shaken on the surface of paper moistened with alcohol becomes red hot by the rapidity with which this action takes place. A coil of fine platinum wire, ignited in the flame of a spirit lamp, continues to glow and the alcohol vapours to burn slowly after the flame has been blown out. This constitutes Sir Humphrey Davy's glow-lamp. Alcohol mixes with water in all proportions, the mixture being accompanied by evolution of heat and reduction of volume, which increases till the mixture contains 116 parts of water to 100 parts of alcohol.

Most of the gases dissolve more readily in alcohol than in water.

The following table, by Gay-Lussac, shows the quantity of absolute alcohol in mixtures of alcohol and water of different densities, at 59° Fahr.

Alcohol.	Water.	Specific Gravity
100	0	0.7947
95	5	0.8168
90	10	0.8346
85	15	0.8502
80	20	0.8645
75	25	0.8799
70	30	0.8907
65	35	0.9027
60	40	0.9141
55	45	0.9248
50	50	0.9348
45	55	0.9440
40	60	0.9523
35	65	0.9595
30	70	0.9656

It is on these differences that depends the action of the instrument [See HYDROMETER] used by the revenue officers in estimating the duty on spirits.

Graham first discovered that alcohol combines in definite proportions with several salts, with which it forms alcoholates, crystallizable compounds of very little stability, since they are all decomposed by water. Nitrate of magnesium dissolved in hot alcohol deposits on cooling a crystalline mass of alcoholate of magnesium nitrate. Fused chloride of calcium dissolved in alcohol deposits crystals containing $4\text{CaCl}_2, \text{H}_2\text{O}$. This substance subjected to dry distilla-

tion yields carburetted hydrogen. Chloride of zinc forms a crystalline alcoholate which when heated breaks up into alcohol, chloride of ethyl, hydrochloric acid, and oxide of zinc. Dichloride of tin forms a somewhat stable crystalline compound, $4\text{C}_2\text{H}_5\text{O}, \text{Sn}_2\text{Cl}_2\text{O}$, which distils at 80° C. without decomposition. Baryta, the chlorides of iron and manganese, and nitrate of calcium form similar compounds.

Alcohol dissolves iodine, bromine, and most substances containing more hydrogen than itself, all the resins, essential oils, camphor, sugar, soap, and numerous acids, with readiness; it also readily dissolves ammoniacal gas. The antiseptic properties of alcohol are great, on account of its power of absorbing moisture from animal and vegetable tissues and coagulating the albumen which they contain, hence its use in preserving anatomical preparations. On account of its ready inflammability, and the purity and intense heat of its flame, it is conveniently, but not economically employed in chemical lamps, usually termed *spirit lamps*. The methylated spirit of commerce consists of a mixture of alcohol of specific gravity 0.83 with 10 per cent. of methylic alcohol or common wood spirit, the latter being added to prevent its use as a beverage, whilst still permitting it to retain all its valuable qualities as a volatile solvent.

Saussure, by passing the vapour of alcohol through a red-hot porcelain tube, decomposed it into carbonic anhydride, water, hydrogen, marsh gas, olefiant gas, naphthaline, empyreumatic oil, and carbon. Alcohol vapour is not decomposed at 300° C. with porcelain alone, but gives off gas at 220° C. if platinum is present.

ALCOHOL, MEDICAL PROPERTIES OF. Alcohol is a narcotico-acid poison. In small doses it occasions excitement and intoxication; in larger ones delirium, somnolency, coma, apoplexy, and death. It acts as a violent nervous stimulant, and by abstracting water from the soft tissues of the stomach and *primæ viæ*, destroys their organization. It is alike poisonous to all animals; two drachms will kill a dog. All strong spirits act in the same way, the effect being proportionate to the state of concentration and the quantity taken. On plants it acts as a rapid and fatal poison. Within certain limits, however, and with proper care, alcohol is an agent which may be beneficially employed in many diseases of the system. Its general properties in this respect are of a twofold kind: first, those in which it is employed on account of its solvent powers; and secondly, those in which its own powers over the human frame lead to its use as a therapeutic agent. The former is treated of under **TINCTURES**.

In the first place it is proper that the mode of action of alcohol should be understood, to determine when it should be used. A single moderate dose, suitable for the individual, produces effects which are entirely limited to the viscera of the abdomen. They extend themselves from the solar plexus of nerves to the organs upon which the splanchnic nerve is distributed, and excite in these a livelier action. A feeling of comfort in the abdomen, quicker and more powerful digestion, stronger peristaltic motions, increased desire for meat and drink, more abundant secretion, are the common phenomena which result from the lowest degree of its action. A larger quantity, or several small doses repeated at short intervals, extend the action beyond the sphere of the splanchnic nerve, even to the spinal chord, the brain, and entire nervous system. The feeling of comfort and warmth experienced in the pericardial region is diffused over the whole frame. The pulse is raised, becomes quicker and more powerful, all muscular actions take place with more ease, strength, and capacity of endurance, the tone of the nervous system is raised, the influence of the nervous energy upon the other organs is speedier and stronger; but, above all, that

part of the nervous system whose functions are executed by the brain is most perceptibly increased, as is seen in the greater cheerfulness, humour, and courage, as well as the more active and acute power of thinking. During this degree of action the sensibility to external impressions is unimpaired, or in many instances even augmented, as is manifested by a more eager participation in the incidents occurring or sentiments expressed, and in the expansion of the affections or passions.

Contemporaneously with these, all the functions of organic life are carried on more actively; of which we have proof in the increased secretions, especially of the cutaneous transpiration and secretion of urine.

The use of alcoholic drinks to produce these exciting effects, however, during moderate health is a practice full of injury and danger to the system; and it cannot be too clearly understood that the systematic use of such drinks is only justifiable in case of a deranged condition of the body, or of a disposition thereto. In marshy districts a generous diet, together with a fair allowance of alcohol in the form of wine, exercises a certain protective influence; and good alcoholics in moderate doses are of assistance to the convalescent exhausted by illness and to the labourer worn out with fatigue. But taken regularly, as a mere stimulant, the increase of heat and energy caused by alcohol is only temporary; it passes away, a collapse or fit of depression follows, and there is an actual diminution of the original stock of serviceable strength. Persistence in such a course must inevitably shorten the term of life very considerably.

ALCOVE. The term is originally from the Arabic language, in which it means simply the cave, hollow, or recess; and it passed into the other European languages through the Spanish. In most of the modern European languages it is applied to a recess in a room intended for a bed. In England alcove is applied to a similar recess in a room of any kind, and yet more commonly to an ornamental covered garden seat.

ALCOY, a flourishing town of Spain, in the province of Alicante, 24 miles N.N.W. of the town of Alicante, is picturesquely situated on the river Alcoy, 35 miles from the sea. It is chiefly famous for its manufacture of paper, of which 200,000 reams are made annually, 180,000 of them being used for cigarettes. It is also celebrated for its sugar plains, and has manufactures of coarse woollen stuffs. There are several fine public buildings and fountains. The population is 27,000.

ALCYONARIA is a group of deep-sea animals, forming a sub-class of the ACTINOZOA, and containing amongst others the "red coral" of commerce, "dead-men's fingers" "organ-pipe coral," and "sea-pens." They are composite organisms, colonies being formed by budding from a single body. Each component is called a *polyp*, and these are immersed in a gelatinous trunk, which is in some kinds strengthened by a horny or calcareous axis, the "coral," and also sometimes by grains or spicules in the surface. The mouth in each polyp is surrounded with eight fringed feelers or tentacles, and the parts of the body are in fours. The body is built up in the same way as the common ANEMONE, but differs in the number of the body-chambers and tentacles. A system of minute tubes connects the body-cavities of the polyps, and through these flows the nutritive fluid.

Representations of the group will be found in Plate II. of ACTINOZOA. *Cornularia*, fig. 1, belongs to the order Alcyoniaceæ. There is no internal axis or "coral," but the outer skin is leathery, slightly contractile, and strengthened by spicules. It is permanently rooted. Another form is *Alcyonium digitatum*, or "dead-men's fingers."

Gorgonia, fig. 7, is a representative of the Gorgoniaceæ, which are fixed, and have an erect, horny, or calcareous

axis, branching like a small shrub. They are often known as "Venus' fans." To this order also belongs the "red coral" of commerce (*Corallium rubrum*).

Isis, fig. 6, belongs to the order Isidaceæ, which come near the Gorgoniaceæ, but the coral is jointed, the joints or knots being calcareous (formed of carbonate of lime), and the intermediate pieces horny.

The "organ-pipe coral" (*Tubipora musica*) is the only genus of the order Tubiporaceæ. It forms large hemispherical masses, with violet-coloured polyps. The coral is here on the outside, forming cups into which the polyp can withdraw. The cups are joined together by horizontal plates, through which pass minute tubes from one polyp to another.

Renilla, fig. 5, *Pennatula*, or "sea-pen," and *Virgularia*, belong to the Pennatulaceæ. The animals belonging to this order have the polyp mass free, floating in the sea, or with the naked part of the stem sunk into sand or mud.

ALD'BOROUGH or **ALDEBURGH**, a watering place and market town in Suffolk, 25 miles from Ipswich, and 94½ miles from London by the Great Eastern Railway. It was once of great extent, and received no less than eight charters between 1529 (Henry VIII.) and 1637 (Charles I.), under the last-named of which it is now governed. The sea has, however, made extensive encroachments, and now covers the old town to a depth of 24 feet. Sandbanks now protect the town, which has become a fashionable resort for sea-bathing. It was formerly a Parliamentary borough, but was disfranchised by the Reform Act of 1832. There is a monument in the parish church of the poet Crabbe, who was born here 21st December, 1754. The population in 1881 was 4305.

ALD'BOROUGH is also a small town 16 miles N.W. of York, in the West Riding. It was the ancient *Isurium*, and many Roman remains have been found here and in the neighbourhood.

ALDE'BARAN, the Arabic name of a large and bright star of the first magnitude, called in modern catalogues *α Tauri*, situated in the eye of the constellation Taurus, whence it is called also by the Arabs *Ain al Thaur*, "the bull's eye." It is the bright star in the group of five known by the name of the Hyades. See PLATE, CONSTELLATIONS, N. Hemisphere, between IV. and V.

ALDEHYDE, acetic aldehyde, or hydride of acetyl (C_2H_4O)—dehydrogenated alcohol—is a volatile colourless liquid resulting from the imperfect combustion of alcohol. It has an ethereal and suffocating smell; its specific gravity is 0.800; vapour density, 1.520. It boils at 69.5 Fahr., and mixes in all proportions with water, alcohol, and ether; it is neutral to test paper, even when dissolved in water. It is isomeric with oxide of ethylene. It has also three other isomeric forms, one liquid and two solid, into which it is converted by long keeping in closed vessels. Exposed to the air, aldehyde is converted more or less rapidly into acetic acid. Heated with potash, the brown resin of aldehyde is produced. Aldehyde burns with a blue flame; it dissolves phosphorus, sulphur, and iodine, absorbs dry sulphurous acid gas with great avidity, forms definite compounds with the acid sulphites of the alkali metals, and reduces salts of silver. Silver mirrors are sometimes manufactured by the reduction of nitrate of silver, and deposition of the metal upon glass by means of aldehyde. Aldehyde is a monobasic acid, and forms aldehydates by the substitution of one of its atoms of hydrogen by a metal.

ALDEHYDE GREEN (aniline green), a green dye which is specially brilliant by candle light. It is prepared by mixing together one part of magenta, three of sulphuric acid, one of water, and a half part of aldehyde, heating till a blue colour appears, and pouring the whole into a dilute boiling solution of hyposulphite of soda.

After boiling for some time the aldehyde green is separated by filtration.

ALDEHYDES, organic compounds formed from alcohols by abstraction of two atoms of hydrogen, and which are converted into acids by addition of one atom of oxygen. The essential oils of many plants—such as the oils of rue, eumin, spirea, laurel, bitter almonds, cinnamon—are for the most part composed of either single or combined aldehydes.

ALDER or **ALNUS** is the generic name of a small group of plants belonging to the order Betulaceæ, a tribe of CUPULIFERÆ.

Alnus glutinosa (the common alder) is an inhabitant of swamps and meadows in all Europe, the north of Africa and Asia, and North America. Next to the charcoal from black dogwood (*Rhamnus frangula*) that supplied by the common alder is of the best quality. The bark is valuable for tanning, and the young shoots for dyeing various colours; the vein knots of its wood are cut into veneer by cabinetmakers, and its stems, hollowed out, are among the best materials, next to metal, for water pipes and underground purposes.

Alnus incana (the Turkey alder or upland alder) is found all over continental Europe, from Sweden to the north of Italy, and east beyond the Caucasus, as far even as Kamchatka.

Alnus cordifolia (the heart-leaved alder) grows with rapidity, and is an interesting ornamental tree. It is a native of Italy.

AL'DERMAN. This word is from the Anglo-Saxon *ældorman*, elder-man: probably originally the elder of the village or mark. Later the earls, governors of provinces, and other persons of distinction were generally termed ældormen by the Anglo-Saxons.

In modern times aldermen are individuals invested with certain powers in municipal corporations, either as civil magistrates themselves or as associates to the chief civil magistrates of cities or corporate towns. In the municipal boroughs of England and Wales resident burgesses elect councillors having a property qualification. The councillors thus elected by the burgesses hold office for three years, and one-third of their number go out annually. The aldermen are elected by the council from its own number for six years, and one-half go out every three years. One-fourth of the municipal council consists of aldermen, and three-fourths of councillors.

In the corporation of London, which was not remodelled by the 5 & 6 Wm. IV. c. 76, the Court of Aldermen consists of twenty-six aldermen, including the lord mayor. Twenty-five of these are elected for life, by such freemen as are householders of the wards. The twenty-sixth alderman belongs to the dependency of Southwark. This alderman is not elected at all, but when the aldermanship is vacant the other aldermen have, in seniority, the option of taking it; and the alderman who does take it holds it for life, and thereby creates a vacancy as to the ward for which he formerly sat. The Court of Aldermen possesses the privilege of rejecting, without any reason assigned, any person chosen for alderman by the electors, and appointing an alderman to the vacancy. The lord mayor is appointed from such of the aldermen as have served the office of sheriff. The Court of Aldermen is the bench of magistrates for the city of London, and it possesses also authority of a judicial and legislative nature in the affairs of the corporation.

AL'DERNEY or **AURIGNY**, the most northerly of the Channel Islands, lying in the Bay of Avranches, near the coast of Normandy. It is the nearest of the group to the French coast, being about 7 miles west of Cape La Hogue, from which it is separated by the Strait or "Race" of Alderney—a Channel very dangerous in stormy weather,

from its conflicting currents. It was through this channel that the defeated French fleet escaped in 1692, after the battle of La Hogue. Alderney is distant from Guernsey about 15 miles, or 20 from port to port; from Jersey about 33 miles, or 45 from port to port; and 60 miles from Portland Bill, the nearest point of England.

The island is about $3\frac{1}{2}$ miles long from N.E. to S.W., $1\frac{1}{2}$ broad, and 8 in circuit; its area being 4 square miles. The S.E. coast is formed by picturesque and lofty cliffs from 100 to 200 feet high. As the approach to the island is often dangerous, three lighthouses are provided on a cluster of rocks called the Caskets, off the western coast. The climate is mild and healthy; the soil sandy, gritty, and gravelly round the coast, but in the valleys it is very fertile, producing excellent corn and potatoes. In the meadows the inhabitants grow rye-grass and clover. The grass lands occupy about one-third of the area of the island. The land is level and generally elevated, and there is a good supply of excellent water. The only exports are early potatoes and the well-known Alderney cows, easily distinguished from those of the neighbouring islands by being remarkably small, and straight in the back.

St. Anne's, which is known simply by the designation of "the town," is situated in a beautiful valley nearly in the centre of the island, with roads leading to Braye and Longy Bays. The inhabitants, who in 1881 numbered 2039, are Protestants, and mostly speak the English language. The old church, which is said to date from the twelfth century, has recently been supplemented by one of modern erection. The parish is in the diocese of Winchester. In addition to the government house, a Gothic arch, erected to the late Prince Consort, is worthy of note. A harbour of refuge, with strong fortifications for its defence, and a breakwater have been constructed. Their utility being considered doubtful, the works were abandoned in June, 1871, after costing about £1,500,000. In 1872, however, on the recommendation of a select committee, the breakwater was repaired. The island contains the decayed foundation of a castle which bears the name of Essex Castle, from having been the residence of the Earl of Essex, the favourite of Queen Elizabeth. The ancient Roman name of the island was *Riduna*.

The civil power is vested in a judge, appointed by the crown, and six *jurats*, who are chosen by the people, and hold their offices for life, unless removed for misbehaviour. These, with twelve *douzainiers*, representatives of the people, form a sort of local legislature, the *douzainiers* having only the power of deliberating, not of voting. The island is a dependency of Guernsey.

AL'DERSHOT, a town in Hampshire, on the borders of Surrey, 3 miles N.E. of Farnham, and $4\frac{1}{2}$ miles from London by the South-western Railway. There is also a route via the South-eastern line. It is now celebrated as the place where the principal camp of the British army is established. Its extent is upwards of 4000 acres, which were purchased by the War Office in April, 1854, for the purpose of forming a permanent camp for 20,000 men, where soldiers might be practically initiated into the details of camp life, and where reviews and military operations might be practised on a larger scale than had previously been usual in this country. There are now also erected on the ground barracks for upwards of 8000 infantry, 1500 cavalry, and for several batteries of artillery, with a military prison and other adjuncts necessary for the accommodation and discipline of the troops. On 7th July, 1856, after the Crimean War, Her Majesty held the first review on a large scale at Aldershot. Experiments in camp cooking, and other matters affecting the comfort of the army in the field, have been successfully made in the camp, greatly to the advantage of the British soldier. The town of Aldershot has grown up around

the camp. The population of the urban sanitary district in 1881 was 20,155; of the parish, 23,698.

AL'DINE EDITIONS, the name given to a series of books which were printed and published by Aldo Manuzio (Latin, *Aldus Manutius*) and his family in Venice between the years 1490-1597. Nine hundred and eight different works were issued during this period, chiefly editions of the Greek and Latin classics, and carefully corrected texts of Boccaccio, Dante, Petrarch, and other Italian authors. They are remarkable for the care exercised in the preparation of the works issued, and the exceeding beauty of the printing. The founder of the house was an enthusiast in typography, and used nine different kinds of Greek type and fourteen of Latin. He first introduced the custom of printing fine paper copies, and was also the first to use the type now called Italics. The distinguishing mark of the house was an anchor entwined by a dolphin. The books soon became exceedingly popular with collectors, and this led, about 1502, to the issue of counterfeit works by the printers of Lyons and Florence. The genuine works have ever since been in great request, and some of them have become, from their scarcity, extremely valuable.

The name Aldine was given to an edition of the British Poets beautifully printed by Pickering, and is also used by a modern firm of publishers in the revised issue.

ALE, an intoxicating beverage obtained from barley or other grain steeped in water and afterwards fermented, has been used from very early times. Pliny the Elder says that the western nations have intoxicating liquors made of grain steeped, that the mode of making them is different in the provinces of Gaul and Spain, and that their names differ, though the principle is the same; he adds that in Spain they had the art of making these liquors keep. He also mentions the use of beer by the Egyptians. In Gaul it was called *cerisia*, a word which was introduced into the Latin language, and is also preserved in the French *cerroise*. (Pliny, xx. 25; Richelet, "Dictionnaire.")

Tacitus states that the ancient Germans "for their drink drew a liquor from barley or other grain, and fermented it so as to make it resemble wine." (Tacitus, "De Mor. Germ." c. 23.) Ale was also the favourite liquor of the Anglo-Saxons and Danes; it is constantly mentioned as used in their feasts; and before the introduction of Christianity among the northern nations, it was an article of belief that drinking copious draughts of ale formed one of the chief felicities of their heroes in the Hall of Odin.

In early periods of the history of England, ale and bread appear to have been considered as equally victuals or absolute necessities of life. This appears from the various assizes or ordinances of bread and ale (*assise panis et cervisie*) which were passed from time to time for the purpose of regulating the price and quality of these articles. In the fifty-first year of the reign of Henry III. (1266) a statute was passed, the preamble of which alludes to earlier statutes on the same subject, by which a graduated scale was established for the price of ale throughout England. In process of time this uniform scale of price became inconvenient; and by the statute 23 Henry VIII. c. 4, it was enacted, that ale-brewers should charge for their ale such price as might appear convenient and sufficient in the discretion of the justices of the peace or mayors within whose jurisdiction such ale-brewers should dwell. See BREW.

ALE-CONNER. An ale-conner is an ale-kenner—one who keeps or knows what good ale is. The office of ale-taster or ale-conner is one of great antiquity. Those who held it were called "gustatores cervisie," and were regularly chosen every year in the court-leet of each manor, and were sworn to examine and assay the beer and ale, and to take care that they were good and wholesome, and sold at proper prices according to the assize; and also to present all defaults of brewers to the next court-leet.

Similar officers were also appointed in boroughs and towns corporate; and in many places, in compliance with charters or ancient custom, ale-tasters are at the present day annually chosen and sworn, though the duties of the office are fallen into disuse.

The duty of the ale-conners appointed by the corporation of the city of London is to ascertain that the beer sold in the city is wholesome, and that the measures in which it is given are fair. For this purpose they may enter into the houses of all victuallers and sellers of beer within the city. This investigation is supposed to be made four times in the year, upon days not known publicly beforehand. Southwark is not visited. In fact, even in the city the investigation into the wholesomeness of the article has fallen into disuse, but fairness of the measures is attempted to be insured by requiring all pots to be stamped with the city arms.

ALEMAN'NI, a word of uncertain origin, possibly signifying all men, the name given by the Romans to the mixed tribes of Germans who inhabited the Upper Rhine country. The first notice of them in history occurs in the year 214 A.D., when they were attacked by the Roman Emperor Caracalla, who appears to have gained a victory, but to have failed to subdue them. After his reign they made frequent incursions into Gaul, and though defeated by Maximinus in 237, and by Valerian's general, Postumus, in 257-260, they attempted to invade Italy in 270, but were driven back by Aurelianus. They, however, still continued their attacks; and in the year 357 the Emperor Julian completely defeated them at Strasburg, where they had assembled a force of 35,000 men under seven or eight of their principal chiefs. In the latter part of the fourth and the beginning of the fifth centuries they occupied the southern and eastern banks of the Rhine, and extended as far west as the Vosges, and as far south as the Helvetian Alps. They were subdued in 496 by Clovis, king of the Franks, who broke their power in a bloody battle at Tolbiacum (now Zulpich), and made them subject to the Frankish dominion. The south part of their territory was formed into a province called *Alamania*, and the eastern part afterwards received from the principal tribe the name of Swabia, which it has since retained. The greater part of the inhabitants of Northern Switzerland, Alsace, and part of Swabia are descendants of this race, and their name survives in the terms *Alamands* and *Allemande* used by the French to denote Germans and Germany generally.

ALEM'BIC, a chemical apparatus used in distillation, consisting of a *body*, *encurbit*, or *matrass*, to contain the fluid to be distilled; a *head* or *caput*, fixed above it to receive and condense the vapour which rises on the application of heat to the encurbit; and a pipe descending from the head to a *receiver*, or vessel prepared to receive the condensed product of distillation, which, in its passage from the head to the receiver, is frequently passed through a *worm* or serpentine pipe immersed in cold water as a refrigeratory. Alembics or stills are made of both glass and metal, the several parts being fitted together with ground or luted joints, and of various forms according to the purpose for which they are employed.

ALEMTE'JO or **ALENTEJO**, the largest province of the kingdom of Portugal, so called from its position (*alem Tejo*, beyond the Tagus). It is bounded N. by the Tagus and the Sever, E. by Spanish Estremadura and Andalucia, S. by the Sierras of Caldeirao and Monchique, which separate it from Algarve, and W. by the Atlantic Ocean and Portuguese Estremadura. The province covers a surface of 10,000 square miles. The population in 1881 was 375,000. There are several mountain ranges, the highest of which is the already-mentioned Sierra de Monchique, one peak of which has an elevation of 4078 feet.

From the northern side of this mountain the waters are collected into the river Sado, which reaches the sea at Setúbal. In the spring the malaria arising from this river is very injurious to the health of the inhabitants. The principal river, the Guadiana, after crossing the Spanish frontier, runs along part of the eastern boundary, and flows southward into the sea. Other mountains are the Sierra de Portalegre, 2130 feet; and Osa, north of Évora, which slightly exceeds this height. The harbours of Sines and Villa Nova de Milfontes are of little value. There are several large plains in the south, some of which are very fruitful, but others are marshy; extensive forests are found in the north. The population is not very industrious, but corn and rice are produced to such an extent as to contribute largely to the support of Lisbon; the supply of wine and oil is less abundant. Grapes, figs, and other fruits grow extensively, and swine and mules are reared. There are many quarries of marble—white, green, and red. The political divisions of the province are Évora, Portalegre, and Beja. Évora, the chief city of the whole province, is the seat of an archbishop; and three bishops take their titles from Elvas, Portalegre, and Beja. Elvas is a place of great military strength, and with the adjoining fortress, La Lipa, protects the frontier on the side of Badajoz.

ALENÇON, the capital of the French department of Orne, a large well-built town, surrounded by fine suburbs, and situated 165 miles W. by S. from Paris, in an extensive and fertile plain at the confluence of the Bièvre with the Sarthe. The streets are wide, well paved, clean, and pretty regular. In the principal square, which communicates with a magnificent walk shaded by fine trees, stand the town-hall, partly former of the ancient castle, and the court-house. The other remarkable structures are the cathedral of Notre Dame, the Church of St. Léonard, the college church, in the upper part of which the public library of 14,000 volumes is kept; the hospital, the corn-market, and the Church of Monsiort, said to date from the twelfth century. The town is the seat of a bishop, has a parliament, a consular tribunal, a council of prud'hommes, a chamber of commerce, and 16,000 inhabitants. It is the centre of a considerable trade in linen, cotton, muslin, and embroidery. The celebrated "point d'Alençon" lace is not so much made as formerly. Tanning, bleaching, paper, and card-making are also carried on. The cutting of quartz-crystals, known as Alençon diamonds, is the leading branch of industry. The town was several times taken in the wars of Henry V. and VI. of England, and again by the Germans in 1871.

ALEPPO or HALEB, the capital of an eyalet of Asiatic Turkey of the same name, is situated in the north-west of Syria. The population is estimated at 70,000; but previous to the earthquake of 1822 it was upwards of 200,000, comprising Turks, Armenians, Greeks, Jews, Maronites, Syrians, and Europeans, the Greeks being the richest and most numerous. The city rose to importance on the destruction of Palmyra, and became the great emporium of trade between Europe and the East. With the suburbs it is about 7 miles in circumference. The houses are of masonry, and uniformly flat-roofed. The celebrated gardens are S.E. of the city. Aleppo has a castle, a Mohammedan college, Christian schools and churches, a Roman aqueduct which supplies it with water, a general's warehouses, and bazaars. The town is built on a hill, called Djebel ben el Kaka. It is surrounded by a stone wall, and has seven gates. Girt, moreover, as it is with pistachio-nut trees, above which rise countless cupolas and minarets, it is one of the most beautiful of eastern cities. The earthquake which happened in August, 1822, destroyed almost two-thirds of the buildings, and upwards of 20,000 inhabitants. Manufactures of silk and cotton goods, gold and silver stuffs, shawls,

&c., are carried on; and there are also soap factories, dye-works, and rope-walks, the latter occupying some caverns near the city. Trade was formerly conducted by more than 100 mercantile houses. Large caravans arrived from Bagdad, Bosra, Diarbekir, Mosul, Kurdistan, and Armenia; but the Suez Canal proved an easier, safer, and cheaper channel of importation for Bagdad and Southern Persia than the old practice of taking European merchandise from Aleppo by caravans of camels. The town may therefore be said to have lost its importance as a market for the sale of European manufactured goods. Aleppo has thus assumed the well-known aspect of Kaiserlich and other inland towns of Turkey whose commercial greatness belongs to the past, with numerous deserted khans and half-closed bazaars.

The ancient name of the town was *Chaleb* or *Chalybon*, which was changed by Seleucus Nicator into *Berea*. It continued to be called by that name until its conquest by the Arabs under Abu Obeidah in 638, when its original name of Chaleb or Haleb was restored. It afterwards became the capital of an independent monarchy under the sultans of the race of Hamdan. In the latter part of the tenth century Haleb was again united to the Greek empire by the conquests of Zimiseh, emperor of Constantinople. During the crusades Haleb was subject to the Seljuke princes. In 1260 it was plundered by the Moguls, and again in 1401 by Timur. It was afterwards annexed to the dominions of the Mameluk sultans of Egypt, but was conquered by Selim I., the Turkish sultan, and has since that time been subject to the sultans of Constantinople.

The inhabitants of the eyalet only cultivate the land in the mountainous districts, which produce wheat and other sorts of corn, melons, olives, cotton, tobacco, figs, &c. The level parts of the country are abandoned to the Kurds and Arabs. The heat of the climate is seldom oppressive, in consequence of the west winds which blow from the Mediterranean. The country is reckoned healthy on the whole, although the city is subject to visitations of the plague about every ten years, and to an epidemic called the boil of Aleppo. The eyalet of Haleb is watered by the Euphrates, the Orontes, and the Koik. The latter rises near Amtab in the north, and passing by the city loses itself in a morass about 16 miles to the south.

ALESSANDRIA, a province of Italy, formerly a division of the principality of Piedmont, containing in 1882 a population of 728,750. Its area is 1951 square miles.

Alessandria is intersected by hills of small elevation, the spurs or offsets of the Apennine chain which divides Piedmont from the Riviera of Genoa. It is bounded on the north by the Po, which receives the Tanaro below Alessandria. The Tanaro is joined by the Belbo a little above Alessandria, and by the Bormida (increased by the Orba) a little below it. The chief products of the province are maize, wine, silk, madder, and the best flax in Piedmont. It contains very little wood.

Alessandria, a town and fortress in Piedmont, the capital of the above province, is situated near the confluence of the Tanaro and Bormida. It was built by the Lombard League in 1168 as a barrier against Frederic Barbarossa (Frederick I. of Germany) and the Ghibelines of Asti. It received its name from Pope Alexander III., the protector of the League, and the strenuous opponent of the emperor. Its citadel is now one of the strongest places in Europe. It has been repeatedly besieged, and taken and retaken, by the French and Austrians. The town, which is the seat of a bishop, is well built, has a fine square planted with trees, a cathedral, a church dedicated to *La Madonna di Loretto*, several other churches, a public library, and some good palaces. The population in 1882 was 57,079, who

carry on a considerable trade. There are some manufactures of linen, silks, cotton stockings, cotton handkerchiefs, and woollen cloth. Alessandria is 48 miles by railway E. by S. of Turin, and 60 N. by W. of Genoa. Two large annual fairs greatly promote its trade. Two miles S.E. of Alessandria, in an extensive plain, is the village of Marengo, celebrated for the victory gained by Napoleon I. over the Austrians in June, 1800. See MARENGO.

When the war with Austria broke out in 1859, the Piedmontese reaped the benefit of all the efforts they had long made to render the fortress one of great strength. Both government and people had alike been anxious to make Alessandria impregnable, because they saw that in the event of a war with Austria for the recovery of Lombardy to the kingdom of Italy, this fort and its sister one, Casale, on the Po, would be of the utmost importance. Thus, led by Manin, a subscription was made to supply 100 guns to Alessandria. What gave additional value to these fortresses in 1859 was the necessity of protecting the roads by which the French army was to arrive, namely, that over Mont Cenis, and that from Genoa over the Apennines. With these fortresses on the two chief rivers as a base, any of the transverse rivers became a temporary line of defence, by which the Austrians could be kept in check until the French arrived.

ALEUTIAN ISLANDS, called also Aleutan, Aleutic, or Aleutsky Islands, these several names being derived from the Russian word *aleut*, which signifies a bold rock. This group of islands is situated in the North Pacific Ocean, between Cape Alaska in North America and the peninsula of Kamtschatka in Asia; describing a circular arc which extends from 163° of W. to 166° of E. lon., and thus comprehends thirty-one degrees of longitude. They are bare and rocky, and of volcanic formation. The most important are the Fox Islands, among which is Unimak, the largest in the archipelago. From the position of the islands—which stretch almost like a broken bridge between the two continents—some ethnologists have supposed that by means of them the first inhabitants of America crossed over from Asia.

The first attempt at geographical discovery in this region was planned a short time before his death by Peter the Great of Russia, with the view of ascertaining the distance between the Asiatic and American continents; and partly by the exertions of a Dane named Behring, and partly by those of the Kamtschadales, the islands were gradually discovered. A Russian survey of the islands was made in 1768, and Captain Cook added to the knowledge respecting them in 1778. In 1785 a commercial establishment for the prosecution of the fur trade was formed there, which received great aid and protection from the Russian government until 1867, when the islands were purchased, with the territory of Alaska, by the United States.

The fur animals which the islands yield are bears, beavers, ermines, otters, foxes, and seals. Almost the only occupations of the inhabitants, who number about 9000, are fishing and hunting, and the preparation of implements necessary for the prosecution of those pursuits. Domestic occupations, such as making clothes, and even the covering of canoes, are performed by the women, who likewise make mats, baskets, &c. The inhabitants are mostly short, but stout made and well proportioned. Little difference is observable in the clothing of men and women, which consists of a frock made of seal skin, fastened round the neck and descending below the knees. The same material is employed for making boots. The food of the islanders consists almost entirely of fish, whale-blubber, and the flesh of sea animals. They provide in summer a store of fish, which they dry and lay up in small huts for winter use. Their habitations are holes dug in the earth

and covered with sticks, over which grass and earth are thrown; the entrance is from the roof, whence also light is admitted through a window covered with dried fish skins.

ALE-WIFE is the common name for a fish of the genus *CLUPEA*, and therefore a very near ally of the herring (*Clupea harengus*). The "ale-wife" (*Clupea mallowocca*) is a North American sea-fish, taking to the rivers in spring for the purpose of spawning in lakes.

ALEXANDER THE GREAT, son of Philip of Macedon, and Olympia, daughter of Neoptolemus, king of Epirus, was born at Pella B.C. 356. His father was a man of great energy, courage, and sound judgment; his mother was possessed of an ardent temper and great force of character, and he appears to have inherited the qualities of both parents. His first tutors were Leonidas, a relation of his mother, and the Achaean Lysimachus. The former endeavoured to train him to the endurance of toil and hardship, the latter inflamed his ambition by the study of the Iliad and by addressing his pupil as Achilles, from which hero, on the side of his mother, Alexander believed himself to have descended. At the age of thirteen he was placed under the care of Aristotle, with whom he remained four years, and by whom he was instructed in every branch of learning. His political education was undertaken by his father, who taught him the mysteries of state-craft and the art of war. He was trained to be expert in all manly exercises, in the use of arms, and in horsemanship, in the last of which he greatly excelled. He won his famous horse Bucephalus, which carried him through most of his great campaigns, by breaking it in when all else were in despair of the task. He was but sixteen when his father marched against Byzantium, and left Macedonia in his charge; and two years later he fought under his father at the battle of Charonea (B.C. 338), where he displayed great courage and impetuosity, and contributed largely towards the victory that was gained.

Two years later his father Philip was murdered during the celebration of his daughter's marriage, and just on the eve of his setting out on an expedition to Asia at the head of the Greek forces; and Alexander, not yet twenty years of age, ascended the throne in the year B.C. 336. His courage and ability at once became manifest by the manner in which he freed himself from the enemies who thickly surrounded him, and in a few months he was chosen leader of the Greeks, and invested with all the honours and authority of his father. He was eager to set out on his expedition to Asia, but before doing so resolved to reduce the tribes on the north of Greece to obedience. Marching swiftly across the passes of the Balkans he defeated the Thracians, the Trilalli, and the Gelæ. While absent on this expedition a false report of his defeat and death led the Thebans to rise against the Macedonian garrison of that city. The news was conveyed to Alexander, and in less than a fortnight he appeared before Thebes, and after a short resistance entered the city, where a terrible slaughter of the inhabitants took place, and the whole of the buildings, with the exception of the citadel and the house of the poet Pindar, were razed to the ground. The Greeks believed this (to them) sacrilegious destruction of the birthplace of the god Dionysus weighed heavily on Alexander's fate. Having thus established his power in Greece, in the spring of B.C. 331 he set out on his Asiatic expedition at the head of a force of 30,000 infantry and about 5000 cavalry; 12,000 of these were Macedonians. His first conflict took place on the banks of the Granicus, where, with but a slight loss on his own side, he destroyed a Persian army of 20,000 men, taking 2000 prisoners, and killing nearly the whole of the remainder. Marching southward the terror of his name went before him. Sardis and Ephesus were entered without a struggle, and Miletus and Halicarnassus were taken after a

short conflict. During the winter he conquered Lycia, Pamphylia, and Pisidia, ending his campaign at Gordium in Phrygia. Here was preserved the yoke and collars of the horses fastened with a complicated knot to the pole of the chariot of Gordius, a former king of the country. A legend declared that the man who could untie the knot would become lord of Asia. Alexander, unable to loose it, cut it with his sword, and claimed the fulfilment of the prediction. Early the next year he set out to meet Darius, the ruler of Asia. He was delayed for a time by a dangerous illness, brought on by rashly bathing when heated in the river Cydnus; but by November, 333 B.C., he arrived in the neighbourhood of Issus, where Darius awaited him at the head of an army of over 500,000 men. The Persian king had displayed the greatest incapacity in the choice of a position and the disposition of his troops, and the first onset of the army of Alexander led to instant flight on the part of the Persians—their king being among the first to lead the way. His mother, wife, and son, and his treasure chest, containing 1000 talents, fell into the hands of Alexander. Refusing to make terms with Darius, Alexander marched through Phœnicia, and after a desperate resistance reduced the city of Tyre, killing 8000 of the inhabitants, and sending 30,000 into slavery. From thence he marched to Gaza, which was taken after a siege of two months, and onward to Pelusium where, without a struggle, the dominion of Egypt was handed over to him by the Persian governor. While in Egypt he visited Heliopolis, Memphis, and the temple of Ammon, where the oracles declared him to be the son of Zeus, and founded the city of Alexandria. Returning to Assyria the following year, B.C. 331, he again encountered Darius, who had gathered an immense army, reputed to number over a million, and was engaged on the broad plain stretching along the banks of the Bureghis, from Gurgurra to Arbela. In the battle which ensued the Persians were completely defeated. Darius fled to Ecbatana and Babylon and Susa opened their gates to the conqueror. From Susa he passed on to Persepolis, the capital of Cyrus, and the burying place of the kings. Here he took possession of the treasure, amounting, it is said, to £40,000,000 sterling, and burned the city to the ground—killing the male inhabitants and making slaves of the women. His avowed motive for this, as indeed for his whole career up to this point, was the avenging of the ancient injuries inflicted on Greece by her hereditary enemy, Persia. After a short stay in the neighbourhood of Persepolis he set out in pursuit of Darius, who had become a prisoner in the hands of the Bactrian satrap Bessus. Learning this Alexander made eager efforts to seize him, and pursued Bessus so closely that he assassinated Darius and fled to Sogdiana. Alexander ordered the body of Darius to be buried with royal honours, and declared himself ruler of Asia. He pursued Bessus until he made him a prisoner, and sent him naked and in chains to the city which had been his capital. Henceforth Greece and Macedonia came but the corners of his vast empire, and Alexander himself claimed to be the "Great King," as much, if not more, an Asiatic than a European monarch. Yet he overbore his love of Greek culture, in his extreme aversion of Oriental manners. If we adopt the favourable view of Frobenius and of Thirlwall, it seems as if Alexander was often so alien to those extravagant honours to be paid him which were usual with Oriental despots, to retain the loyalty of his Eastern empire, and at the same time driven to a moderate descent to justify those honours with the Greeks; but all authors, even Grote, allow that he believed truly in the divine origin. The year 330 B.C. was marked by the execution for treason of his officer Philotas and of Parmenion, his father, which awakened general indignation among the soldiers. The following year, 329 B.C., he overran parts of the country now known as Afghanistan,

and penetrated as far north as the Jaxartes, where he founded another city of Alexandria, still preserving its name in the corrupted form of Candahar. The path of the conqueror across Asia may be traced by the many Alexandrias he founded. He recrossed the Oxus, and spent the next winter, 329–328 B.C. at Bactria. It was here, during a festival in honour of Castor and Pollux, and the drunken revellings which followed, that Alexander slew with his own hand his friend Cleitus. The following year he subdued the district of Sogdiana, and took prisoner the wife and daughters of the governor Oxyartes. One of the daughters, named Roxana, he married. Another conspiracy was discovered here and put down as ruthlessly as the first. In the year 327 he advanced to the conquest of India, and crossed the Indus early in the year 326. He encountered Porus, an Indian king, at the head of a formidable army on the banks of the Hydaspes, and totally defeated him. Thence he marched through the Punjab, and reached the Hyphasis, now known as the Sutlej, where his troops, exhausted by their journey, resolutely refused to go any further. He was compelled to return to the Hydaspes, where he built a fleet, and sending part of his army in it down the river he marched with the rest towards the sea, successfully encountering the armies opposed to him, and founding naval stations at Pattala and at another place, now unknown, on the delta of the Indus. In the autumn of the year 325 he ordered the fleet, under Nearchus, to proceed along the coast to the Persian Gulf, while he marched with one division of the army through Beloochistan—the other division being ordered to proceed through Afghanistan. On this march both divisions suffered greatly from want of supplies, and lost more men by famine and sickness than had been slain in all the battles fought during the campaign. The remainder wintered at the capital of Carmania, and passing through Pasargadae, the burial place of the great Cyrus, and Persepolis, they rested at Susa in the year 324 B.C. Of those who had started, but a fourth part returned to Persia. At Susa, to attach his Oriental subjects, he married Statira, the daughter of Darius, and Parysates, the daughter of Ochus. Eighty of his chief officers also married Persian women, and he offered a present to every Macedonian soldier who would marry a Persian wife. About 10,000 of the soldiers followed their leaders' example, and each man was registered and received a liberal gift. Towards the close of this year, 324 B.C., Alexander visited Ecbatana, the northern capital of his empire, where his favourite Hephæstion died and was buried with royal honours, nearly £2500,000 sterling being expended upon his funeral. On his return to the city of Babylon he was met on his way by ambassadors from nearly every part of the known world—Greece, Italy, Carthage, Libya, the Scythians, Celts, and Iberians. The Chaldean magi, however, warned him that he ought not to enter Babylon—predicting that if he did the result would be disastrous. For a time he hesitated, but ultimately entered the city, which he proposed, on account of its central position, to make the centre of his empire. Here he occupied himself in making plans for future conquests, in preparing a fleet for a campaign against Arabia, and in an attempt to drain the marshes around Babylon. He was taken suddenly ill after a tremendous drinking bout, or possibly from injury caught from these same marshes, and died eleven days afterwards, in May or June, 323 B.C., in the thirty-second year of his age, and after having reigned twelve years and eight months. His body was embalmed, and finally deposited at Alexandria in Egypt. He appointed no heir to his vast dominions, and after his death his generals recognized as nominal kings two of his sons, while they divided the empire between themselves under the name of satraps.

The chief authority for the campaigns of Alexander is

Arrian's "Anabasis." This is the most trustworthy authority extant, as it is founded on the histories of Ptolemy, afterwards king of Egypt, and of Aristobulus, both of whom accompanied Alexander in all his campaigns. The History of Quintus Curtius is almost a romance; and the "Life of Alexander," by Plutarch, though it contains some facts not mentioned by Arrian, must be read with due caution. Many anecdotes are preserved by Athenæus and by Strabo. But all five writers (as Mr. Freeman justly points out, "Historical Essays," vol. ii., 1873) write at second-hand, and the earliest is about three centuries after Alexander's death. Mr. Grote, in his unrivalled "History of Greece" (bk. xii.), regards Alexander throughout as completely non-Hellenic, a conqueror of Greece and of Asia alike; but the strong Athenian and democratic sympathies of that author probably biased his judgment. The view of the other great English historian (Bishop Thirlwall) seems much to be preferred as to this period. It is undoubted that at the beginning of his conquests Alexander was the acknowledged captain of Greece, and was animated by Greek spirit; it is equally undoubted that he lost both characters at Persepolis. How far Macedonia as a nation is fairly to be called Greek is another question.

Alexander the Great was the third king of his name in Macedonia. In our Plate of COINS (Plate 1) will be found engraved a beautiful silver tetra-drachma bearing his likeness; this is a coin of the value of 3s. On the same Plate there is another coin of the same value, of his ancestor Alexander I. of Macedon (about 500 B.C.), who is only remarkable as having been compelled to join Xerxes in his invasion of Greece, B.C. 480; his help, however, was not of much value to the Persians, since he took care to acquaint the Greeks beforehand of all movements known to him. The coin bears the peculiar square mark of the punch which characterizes very early specimens, as described in our article COINS.

ALEXANDER I., surnamed *Balas*, was king of Syria from B.C. 150 to 145. His predecessor, Demetrius I., caused a rebellion by his bad government, and Alexander, who was a man of low birth, took advantage of this occasion to pretend that he was a son of Antiochus Epiphanes, and had a claim to the throne of Syria. He went to Rome, where the senate acknowledged his claim, and the pretender returned to Syria and commenced a war against Demetrius. Alexander obtained the support of Jonathan the Maccabee, and after losing one battle (B.C. 152), he gained a decisive victory over Demetrius (B.C. 150), who lost his life. Alexander Balas then mounted the throne of Syria, and at Ptolemais married Cleopatra, a daughter of Ptolemy Philometor, king of Egypt. Balas left the cares of administration to his favourite Ammonius, in order to enjoy a luxurious life. Ammonius put to death those members of the royal family of Syria whom he could get into his power, but there still lived in the island of Cnidus two sons of the last king, the elder of whom, Demetrius II., landed in Cilicia, and Balas marched against him. Ptolemæus, who had apparently come to assist his son-in-law, suddenly embraced the cause of Demetrius, after accusing Balas of an intention to murder him. Balas, being defeated by Ptolemæus, escaped into Arabia, where he was murdered by an Arabian chieftain. Demetrius II., surnamed Niketor, or the Conqueror, then ascended the throne of Syria. (Josephus, "Antiquities of the Jews," xxxiii. 2; 1 Maccabees x.)

ALEXANDER I., one of the earliest bishops of Rome (or popes, as they were afterwards called), succeeded Evaristus about the beginning of the second century of our era, probably 109 to 119.

ALEXANDER II. See POPE.

ALEXANDER III., Cardinal Rolando of Siena, succeeded Adrian IV., as pope, in 1159. His long pontificate of twenty-one years was agitated by wars against the Emperor

Frederick I., and by a schism in the church, during which three successive anti-popes were raised in opposition to Alexander. [See **FREDERICK I.** (Barbarossa).] He died at Rome in 1181. Thomas à Becket was archbishop of Canterbury during Alexander's pontificate. Alexander took part with the English prelate in his contest with King Henry II., and canonized him after he had been murdered.

ALEXANDER IV., V. See POPE.

ALEXANDER VI., Roderic Borgia of Valencia, in Spain, a man of great personal wealth and of some ability, but of execrable conduct, was elected pope by sheer bribery in 1492, after the death of Innocent VIII. At the time of his election he had four children by his mistress, Vanozia, and after he became pope he made no scruple at employing every means in his power to confer on them honour and riches. The most notorious of his sons was Cæsar, first cardinal, and afterwards made Duke of Valentinois in Dauphiny by King Louis XII. of France, from which he was styled the Duke Valentine, a name which he rendered infamous by his atrocities. The politics of the pope were capricious and faithless in the extreme. He alternately sided with the French and with the King of Naples. His internal policy was, if possible, still more perfidious. He was bent upon the destruction of the great Roman families of Colonna, Orsini, and Savelli; and either by treachery or open violence he in great measure succeeded in putting to death most of them, and seizing on their extensive possessions. He sent his son, the Duke Valentine, into the Romagna, where, by means of similar practices, the duke made himself master of that country, entrapping and strangling the independent lords and petty despots of the various towns. Alexander gave his only daughter, Lucretia Borgia, in marriage, first to Giovanni Sforza, lord of Pesaro, whom she afterwards divorced; then to a prince of the house of Aragon, who was murdered by her brother Cæsar; after which she lived some time in the pontifical palace, sharing in the intrigues and licentiousness of that court. She was married a third time, in 1501, to Alfonso d'Este, son of Hercules, duke of Ferrara, to whom she brought as a dowry 100,000 golden pistoles, besides jewels. Alexander's eldest son, John, duke of Gandia, while returning from a debauch, was murdered one night by unknown assassins, and thrown into the Tiber. (Roscoe's "Leo X." vol. i.) At last Alexander himself died on the 18th of August, 1503, being seventy-four years of age. It was said, and several historians have repeated the assertion, that he died of poison which was intended for his guest, the Cardinal of Corneto. The pontificate of Alexander VI. is certainly the blackest page in the history of modern Rome.

ALEXANDER VII., VIII. See POPE.

ALEXANDER I., King of Scotland, was a younger son of Malcolm III. (Canmore), and succeeded his eldest brother Edgar, who died without issue on the 8th of January, 1107. In those times in Scotland, as well as in other countries, the succession to the throne was frequently regulated, at least to a certain extent, by the will of the reigning king; and Edgar, at his death, left part of his dominions to his younger brother David. Alexander was at first inclined to resist this appointment, but he eventually acquiesced in it. His reign, almost from its commencement, was agitated by successive insurrections, every one of which, however, he promptly put down. One of the most serious was that excited in the district of Moray, in 1120, by Angus, the grandson of Lulach, son of Macbeth's queen, and the occupant of the throne for a few months after the death of that usurper. Angus claimed the crown in virtue of this descent, but the attempt was met by Alexander with his usual decision, and speedily quelled. Alexander showed equal spirit in resisting all foreign encroachments upon the independence of his king-

dom. He died at Stirling, without leaving any legitimate issue, on the 27th of April, 1224, and was succeeded by his brother, David I.

ALEXANDER II., King of Scotland, was born at Haddington on the 21th of August (St. Bartholomew's day), 1198, and succeeded his father, William the Lion, on the 4th of December, 1214, being crowned at Scone on the following day. He began his reign by entering into a league with the English barons who were confederated against King John, engaging to aid them in their insurrection on condition of being put in possession of the northern counties of England. This led to several devastating incursions into each other's dominions by the two kings. The death of John, in October, 1216, put an end to their hostilities; and the following year Alexander concluded a treaty of peace with the new sovereign of England, Henry III., one of the conditions being that Alexander should espouse Henry's eldest sister, the Princess Joan. This marriage accordingly took place on the 25th of June, 1221. In the course of the following thirteen or fourteen years Scotland was disturbed by insurrections which broke out successively in Argyle, Cathness, Murray, and Galloway, all of which, however, Alexander succeeded in repressing. The death of Queen Joan, without issue, on the 4th of March, 1238, and the marriage of Alexander on the 15th of May in the following year with Mary, daughter of a French nobleman, Ingelram de Comci, broke the bond of amity which had so long existed between the English and Scotch kings; and after some years of mutual dissatisfaction and complaint, they prepared to decide their differences by arms in 1244. By the intervention, however, of some of the English nobility, bloodshed was prevented, after Alexander had approached the border with an army, it is said, of 100,000 men; and a peace was concluded at Newcastle in August of that year. In 1247 another insurrection broke out in Galloway, which Alexander soon succeeded in putting down. In the summer of 1249 he had set out at the head of an army to repress a rebellion raised by Angus, lord of Argyle, when he was taken ill at a small island, variously spelt Erray, Kerreray, Kirarry, or Kirarry, off the coast of Argyle, and died there on the 8th of July. By his second marriage he left an only son, his successor.

ALEXANDER III., King of Scotland, the son and successor of Alexander II., was born at Roxburgh on the 4th of September, 1241. Although only eight years old at his father's death he was crowned at Scone. He had already, when only a year old, been betrothed to Margaret, the eldest daughter of the English king, Henry III.; and notwithstanding the youth of both parties, the celebration of the marriage took place at York on the 25th of December, 1251. The connection thus formed, together with the minority of his son-in-law, gave Henry a plausible pretext for interfering, as he was very anxious to do, in the affairs of Scotland; and the distracted state of that kingdom, occasioned by the factions among the nobility, facilitated his views. It was the commencement of the design so perseveringly pursued by Henry and his successor to reduce the Scottish kings to the condition of vassals. The eminent talents, however, which Alexander began to display as soon as he came of age and took the administration of affairs into his own hands, effectually thwarted the further prosecution of these views so long as he lived. Meanwhile he kept on good terms with his father-in-law. In 1269 he visited London with his queen; and in February, 1261, the latter was delivered of a daughter at Walsby, who was named Margaret.

Alexander had not long assumed the government when he was called upon to meet a foreign power which aimed at the conquest of the kingdom. On the 1st of October, 1264, Hacon, king of Norway, approached the coast of

Ayrshire at the head of a numerous fleet, but a storm and a battle completed the destruction of the invading force, and Hacon with difficulty made his escape, only to die of a broken heart a few months afterwards. Next year Magnus, Hacon's successor, agreed to relinquish to the King of Scotland the Hebrides and the Isle of Man for the sum of 4000 marks and a small yearly quit-rent. In 1282 the peace between the two kingdoms was further consolidated by the marriage of Alexander's daughter, Margaret, to the Norwegian king, Eric, then a youth of fourteen. Margaret died in 1283, but left a daughter of the same name, commonly designated the Maiden of Norway, who eventually became the successor of her grandfather on the Scottish throne.

The successful resistance which, seconded by his clergy, he offered to an attempt of the pope to levy certain new imposts in his dominions, is almost the only other act of Alexander's reign which history has commemorated. Under his sway Scotland appears to have enjoyed a tranquillity to which she had long been a stranger, and which she did not regain for many years after his decease. The death of his daughter Margaret, however, was the first of a succession of calamities. His son died without issue, and a second marriage of Alexander's was equally unfruitful. On the 16th of March, 1286, as he was riding in a dark night between Burntisland and Kinghorn, on the banks of the Frith of Forth in Fifeshire, he was thrown with his horse over a precipice, and killed on the spot. The death of Alexander, followed as it was in a few years by that of the Maiden of Norway, was one of the most unfortunate events that ever befell Scotland. Alexander was deservedly lamented by his subjects on account of his wisdom and virtues. The country had never before enjoyed such prosperity, and during this reign Scotland may be said to have passed from semi-barbarism to civilization. The national misfortunes which followed the death of the king heightened the sense of his loss.

ALEXANDER I., Emperor of Russia, called Alexander Pavlovich, was born on the 23rd December, 1777. He was the son of Paul, afterwards emperor, and of Maria, daughter of Prince Eugene of Wurtemberg. His education was directed by his grandmother, the reigning empress, Catharine II., who lived until he had attained his nineteenth year. Alexander married, in 1793, the Princess Louisa Maria Augusta of Baden. Catharine was succeeded, in 1796, by her son Paul, whose mad reign was put an end to by his assassination on the 24th of March, 1801. Alexander was forthwith proclaimed emperor and autocrat of all the Russias.

The first indication of the policy of Alexander was the conclusion of peace with England, in 1801. After the declaration of war by England against France in 1803, symptoms began to appear of an approaching breach between Russia and France, and a treaty of alliance with England was concluded in 1805, to which Russia, Austria, and Sweden were parties. This coalition speedily led to actual hostilities. The campaign was eminently disastrous to the allied powers. A succession of battles, fought between the 6th and the 18th of October, almost annihilated the Austrian army. On the 2nd of December the Austrian and Russian troops, commanded by the two emperors in person, were beaten in the battle of Austerlitz. The immediate consequences of this great defeat were, the conclusion of a convention between France and Austria, and Alexander's departure to Russia with the remains of his army. A coalition between Prussia and England was concluded in 1806. On the 8th of October hostilities recommenced, and the victory of Jena, gained by Bonaparte, laid the Prussian monarchy at his feet. The battles of Eylau and Friedland, in which the Russian armies were signally defeated, terminated the campaign. An armistice was arranged on the 21st of June, and five days after Alex-

ander and Napoleon met in a tent erected on a raft in the middle of the Niemen. A treaty of peace was signed between the two at Tilsit on the 7th of July, by a secret article of which Alexander engaged to join France against England. He accordingly declared war against his late ally on the 26th of October following.

The friendly relations of Alexander with France continued for nearly five years. His policy, which afforded some gratification to his ambition, entailed a vast amount of privation on his people, by severing their commercial connection with England. It was found impossible to carry out the continental system of Bonaparte, and a rupture with France became inevitable. On the 19th of March, 1812, Alexander declared war against France; and on the 24th of April he left St. Petersburg to join his army on the western frontier of Lithuania. The immense army of France, led by Napoleon, entered the Russian territory on the 25th of June. As they advanced the inhabitants fled as one man, and left the invaders to march through a silent desert.

On the 7th of September took place the first serious encounter between the two armies, the battle of Borodino, in which 25,000 men perished on each side. On the 14th the French entered Moscow. In a few hours the city was a smoking ruin. Napoleon's homeward march, and the destruction of his magnificent army, were the first decisive blows to the mighty fabric of the French empire.

In the early part of 1813 Prussia and Austria successively became parties to the alliance against France. Alexander continued to accompany the allied troops throughout the campaign of the summer. He was present at the battle of Dresden, and of Leipzig. On the 30th of March, 1814, 150,000 of the troops of the allies were before the walls of Paris; and on the following day at noon, Alexander and Frederick William entered that capital.

After the deposition of Napoleon, Alexander and the King of Prussia visited England. The congress at Vienna opened on the 3rd of November, 1814. In the political arrangements made by this assembly, Alexander obtained his share of advantages, having been recognized as king of Poland. Before the members of the congress separated, however, news arrived of Bonaparte's escape from Elba. They remained together till after the battle of Waterloo; when Alexander, with the Emperor of Austria and the King of Prussia, proceeded to Paris, where they arrived in the beginning of July, 1815, and where, on September 26, they signed the very questionable treaty to which they gave the name of the Holy Alliance. After these great events the remaining years of Alexander's life appear comparatively unimportant. His influence was felt in the direction of European affairs, and that influence was not favourable to liberty.

In the beginning of the winter of 1825 Alexander left St. Petersburg on a journey to the southern provinces. About the middle of November he was suddenly attacked by the common intermittent fever of the country. When he arrived at Taganrog, on the Sea of Azof, he was very ill, and on the morning of the 1st of December he expired. It was for some time rumoured in foreign countries that he had been carried off by poison; but it is now well ascertained that there is no ground whatever for this suspicion.

The advancement of almost every branch of the national prosperity in the course of the quarter of a century during which Alexander filled the throne, was probably greater than at any other period from the reign of Peter the Great. Education, literature, and the arts were liberally encouraged; the agriculture, manufactures, and commerce of Russia were all immensely extended during his reign. Alexander had no issue. On his death his next brother, the Grand-duke Constantine, surrendered the throne to his younger brother Nicholas.

ALEXANDER II. Emperor of Russia, surnamed Nicolaeitch, the eldest son of the Emperor Nicholas by his wife Alexandra Vsesdorowna, sister of Frederick William IV. of Prussia, was born 29th April, 1818. He was carefully educated by his father, and was declared of age at sixteen, when he was appointed Captain of the Cossacks, and first aide-de-camp of the emperor. It is said that he showed so little relish for military affairs that he jeopardized his claim to the throne. In 1841 he travelled through Germany, and while there he married the Princess Maximilienne, daughter of Louis II., grand-duke of Hesse. On his return to Russia he made efforts to gain the affection of the Finns, and as chancellor of the University of Finland founded a chair for the study of the language. He is said to have regretted the attitude taken up by his father towards Europe, and strongly disapproved of the steps which led to the Crimean War. On the 2nd March, 1855, his father died, broken down by the disasters of the struggle, and he ascended the throne at a period of great perplexity and trial. Public opinion in Russia was greatly divided, the cultivated and intelligent classes being anxious for peace, while the old Muscovite party was zealous for a continuance of the war. He issued a proclamation in which he announced his intention of maintaining the policy of his predecessor; but the successes of the allies induced more moderate feelings, and after the fall of Sebastopol, 8th September, 1855, terms of peace were agreed upon, and the allied troops were withdrawn. After the close of the war he directed his endeavours towards the development of the resources of Russia, and encouraged the building of railways and a mercantile fleet. He also encouraged education, and made several attempts to reform the system of universal corruption by which the internal affairs of his empire were carried on. He issued a ukase in May, 1856, by which all Polish exiles who were willing to express repentance were permitted to return home, but this did not result in any great improvement of the condition of Poland, and an insurrection took place in 1863, which was suppressed with great cruelty, after a struggle of several months. The great achievement of his reign, however, took place on 3rd March, 1861, when he emancipated 23,000,000 serfs—a step which marks an epoch in the history of Russia. In 1865 he established elective representative assemblies in the provinces, for the management of local affairs. In 1866 he began a series of wars in Central Asia by a campaign against the Ameer of Bokhara, which was followed by another against the Khan of Khiva in 1873, and was succeeded by further advances eastward. In 1870, taking advantage of the defeat of France by Germany, he obtained a reversal of the stipulations made with respect to the Black Sea after the war of 1854–55. In 1877–78 he made war upon Turkey, and though at the outset his troops were very inefficiently handled and met with severe disasters, he was ultimately successful, and the Russian army encamped within sight of Constantinople. The closing years of the emperor's life were embittered by repeated attempts to assassinate him by the Nihilists. He was shot at whilst walking in the streets of St. Petersburg, a mine was fired under the railway by which he was expected to travel, the dining-room of his palace was blown up with dynamite, and the assassins finally accomplished their design on the 13th March, 1881, when he was killed at St. Petersburg by a hand grenade charged with explosive chemicals thrown at him as he was driving along the streets.

ALEXANDER JAROSLAWITZ NEVSKOJ enjoyed a high renown among his countrymen for bravery, prudence, and religious zeal; he has been celebrated in many a Russian ballad, and is still venerated. He was the second son of the Grand-duke Jaroslaw II. Wscladowitz, and was born at Wladimir in 1219. His father had submitted to the Tartar rule, and received Wladimir as a fief

from Batu Khan, by whom he himself was confirmed in that grand-duchy in 1245.

Alexander, while his father was still alive, had distinguished himself by two great victories, one over the Swedes and another over the united order of the Livonian and Teutonic Knights of the Sword. Pope Gregory IX. instituted a crusade against him by the Estonian and Livonian Knights of the Sword, to whom he joined the Teutonic order; but their forces were totally defeated on the 15th of July, 1240, at the confluence of the Ishora and the Neva. By this victory he obtained the honourable surname of Nevskoj, or Alexander of the Neva. While he was thus engaged the Knights of the Sword, commanded by their chief, Hermann von Balk, had taken Pleskow. Early in the year 1241 Alexander marched against them from Novogorod, and drove them out of Pleskow; but next winter saw the enemy again in the field. The Knights of the Sword had advanced within 20 miles of the city of Novogorod. With great speed Alexander again collected his army, pursued the retreating enemy, and on the 5th of April, 1242, fought them on the ice of the Lake of Peipus, where he gained a decisive victory: 400 Teutonic Knights were slain and fifty taken prisoners. Those of the prisoners who were Germans were pardoned, but the Estonians Alexander ordered to be hanged, considering them as Russian rebels. Arms proving unavailing, the Roman court had recourse to diplomacy as a surer means for converting Alexander. This attempt, however, likewise failed; but though Alexander was successful against the pope he continued a vassal of the Tartars as long as he lived. It does not, however, appear that during his reign Russia was actually invaded or plundered by them.

He repulsed the great horde three times, and died on his return from the last of these journeys at Kassimcow in 1263; from that place his body was removed to Wladimir, and there interred. The foundation of St. Petersburg in 1703 on the very spot where the national hero had gained such an important victory, naturally recalled the memory of Alexander Nevskoj in a lively manner. The Czar Peter on this occasion instituted St. Alexander Nevskoj's Order of Knighthood, but did not himself give that decoration to any one; this was first done after his death by his consort Catharine. There is also in St. Petersburg a St. Alexander Nevskoj Monastery, which is well endowed, and to which is now attached a seminary for the education of young divines, called St. Alexander Nevskoj's Academy.

ALEXANDRIA (Turkish, *Skanderieh*) owed its origin to Alexander the Great, who, on his visit to Egypt (B.C. 332), gave orders to erect this city between the sea and the Marcotic Lake.

A place called *Soma* (the body), in the quarter of the palaces, contained the tomb of Alexander the Great. Besides the canal which united Port Eunostus with the lake, there was a canal from the lake to the town of Canopus, situated near the mouth of the western branch of the Nile. By this canal the city was supplied with river water.

The city was embellished by the Ptolemies with the spoils of the ancient towns of Egypt, and for several centuries continued to receive accessions and improvements. At one time it was the rival of Rome in size, and the first commercial city of the earth. Diodorus, who visited Alexandria about B.C. 60, says that the registers showed a population of more than 300,000 free citizens, and there were probably at least as many slaves.

The chief monument of old Alexandria is the column commonly but wrongly called Pompey's Pillar. It stands on a pedestal of earth about 40 feet high, which contains remains of former constructions. The shaft, which consists of a single piece of red granite, is about 67 feet long, and weighs at least 276 tons; the whole

height, with the capital, which is in bad taste, and the base and pedestal, which are no better, is about 94 feet. According to a Greek inscription on the plinth of the base, it appears to have been erected (though perhaps not for the first time) in honour of the Emperor Diocletian, by a prefect of Egypt whose name cannot be further deciphered than that it begins with P.O.

From B.C. 223 to B.C. 30, when Alexandria fell into the hands of the Romans, it was the residence of the Greek kings of Egypt, the resort of commerce and of many foreign nations, especially Jews; and also the centre of the scientific knowledge of that day. In the campaigns of Julius Caesar at Alexandria, B.C. 48, the place sustained much damage.

From B.C. 30 to the Arab conquest under Omar, A.D. 640, Alexandria was still a flourishing city under the Roman emperors, and afterwards under the eastern empire. It was made an imperial city by Augustus, and was governed by a prefect appointed by the emperor. It became one of the most important granaries of Rome. The city early adopted the Christian religion, and became one of its strongholds. It was also the theatre on which the Christians showed the most determined hostility to all the works of pagan art. Subsequent to 640 the city rapidly declined in importance, and in 969 the Fatimite caliphs seized on Egypt, and built New Cairo, from which time Alexandria declined still more, and sunk to the rank of a secondary Egyptian city; the discovery of the route round the Cape of Good Hope, in 1497, tended still further to diminish the commerce of Alexandria; but in recent years it has again become an important position, in consequence of lying on the way of the route to the British possessions in India.

The present city is not situated exactly on the site of the old one, but stands on a peninsula which joins the continent to the ancient island of Pharos, and which is shaped something like a capital letter T, the base of which joins the mainland, while the two horns, curving north-east and south-west somewhat towards the shores, are in the waters of the Mediterranean. The climate of Alexandria is mild and salubrious. The heats of summer are modified by the N.W. winds from the sea, which prevail during nine months of the year—the thermometer seldom rising above 85° Fahr. In winter a great deal of rain falls, and throughout the year the atmosphere is generally moist, being saturated with vapour from the sea.

In the construction of the older parts of modern Alexandria the materials of the ancient city were somewhat extensively employed. In the Turkish quarter the streets are irregular, narrow, dirty, and unpaved; but in the Frank quarter, its fine square and new streets gave it more the appearance of a European than an African or Asiatic city, and country houses lined a part of the ancient canal leading to the W. arm of the Nile, which was restored by Mehmet Ali.

There are two harbours, the eastern, which is exposed and but little used, and the western; the latter is an excellent one, and comprises an area of 1800 acres. It has tolerably good holding-ground, and is protected to a great extent by outside reefs from heavy seas. From the want of proper beacons and landmarks it was, however, formerly difficult of entrance, and could not with safety be attempted without a pilot by vessels drawing more than 16 feet, nor at night by any. Between 1871 and 1875, however, an English company constructed a breakwater, docks, and a line of quays, with all the newest appliances for loading and discharging cargo, which made it a thoroughly safe, commodious, and convenient port. It is supplemented by an inner and even more secure port of 475 acres, with a depth of 27 feet, separated from the outer harbour, and from whatever sea penetrates to it, by a mole nearly 1000 yards long and 100 feet wide.

Alexandria is the chief commercial town of Egypt. The products intended for foreign export are conveyed by the Nile and Mahmoudieh Canal and railway from Cairo to Alexandria for shipment. The principal exports are—cotton and cotton-seed, corn, beans, coffee, sugar, linseed, ivory, wool, gum, rice, dates, senna, feathers, and hides; import—cotton, woollen, and silk goods, hardware, coal, and timber.

Scarcely any city out of America has made such wonderful progress as Alexandria in so short a time. When Napoleon made his expedition to Egypt it consisted of a miserable congeries of Arab huts and old fortifications, and the whole population was under 7000. In 1842 it had reached 60,000, and in 1881 it numbered 250,000, being composed of a great mixture of races, of whom over 50,000 were foreigners. The forts which guarded the approach to the city formed two separate systems of defence, of which one commanded the new port and eastern end of the town, and the other the western harbour. In consequence of the proceedings of Arabi Pasha in 1882 [see EGYPT], the British and French fleets reached Alexandria on the 20th of May. Matters at Cairo rapidly assumed a threatening aspect, and hundreds of Europeans left that city for Alexandria, where the Egyptians, acting doubtless under the orders of Arabi Pasha, had already begun covertly to strengthen the fortifications and erect new works. Fresh vessels were fast added to the Anglo-French squadron, and Admiral Beauchamp Seymour, in command of the British fleet, perceived that not only were the forts being extensively armed, but that formidable earthworks were being thrown up. On Sunday, 11th June, a serious disturbance broke out in Alexandria, which, though professedly only a quarrel between a Maltese and a donkey-boy, was evidently premeditated as an assault on the Europeans, as it began simultaneously in various parts of the city. For several hours the town continued in a most alarming state, and before the authorities sent out troops to quell the riot it was estimated that 250 Europeans had been killed. On the following day a perfect stampede set in, and during the next few days it was estimated that 50,000 Europeans had left Egypt. Meanwhile the works on the fortifications in Alexandria were resumed, and Admiral Seymour informed the Egyptian government that as these works were hostile to the fleet, he would immediately fire on the forts if they were not discontinued. He was assured that no fresh works had been undertaken; but the electric light by night and reconnoitring parties by day plainly showed the Egyptians to be as busy as ever. The admiral determined to permit no further trifling, and at daybreak on Monday, 10th July, an ultimatum was despatched, giving the Egyptian authorities twenty-four hours to surrender the forts for disarmament, under the penalty of bombardment. The British squadron at once began to prepare for action, but the French vessels, which had received strict orders not to take part in the conflict, left for Port Said. The terms of Admiral Seymour were refused, and at six o'clock on Tuesday, the 11th of July, the British fleets opened fire on all the forts at once. The Egyptians replied with great resolution and energy. The fierce British cannonade, however, soon began to tell (it was the first occasion on which 81-ton guns had been used in actual warfare), and before nightfall the harbour defences were rendered untenable.

Under cover of a flag of truce, Arabi Pasha retreated with the Egyptian army early in the following afternoon. Some soldiers, joined by a large body of convicts from the prisons which had been opened, then commenced to sack and fire the European quarter of Alexandria, and in a few hours nearly the whole of it was in flames. As soon as Admiral Seymour became aware of the state of matters on shore, he landed (13th July) a force consisting of all the available marines and some sailors with Gatling guns

under command of Captain Fisher of H.M.S. *Invincible*, to restore order. An efficient police was speedily organized, and Alexandria was soon after garrisoned by British troops under Sir A. Alison. The removal of the base of the succeeding military operations to Ismailia on the Suez Canal diverted public attention from Alexandria until after the battle of Tel-el-Kebir. The city suffered but slightly from the outbreak of cholera in 1883, though trade was much interfered with, and the buildings destroyed by fire are being gradually restored, as compensation is granted by the Egyptian government to the owners.

ALEXANDRIA, a city and port of entry in the state of Virginia, North America, in the district of Columbia is situated on the west side of the Potomac, about 105 miles from the mouth of the river. Ships of the line can ascend the river as far as Alexandria, which is 6 miles S.S.W. from Washington. The town slopes down to the river, with the streets at right angles to one another. It has a court-house, theatre, market-house, and several places of worship. Good wharfs extend along the river about half the length of the city. The chief exports are wheat, Indian corn, and tobacco. The population in 1880 was 16,000. The Chesapeake and Ohio Canal extends to Alexandria, and there is also good railway accommodation. There are many other places in the United States of this name, and also a town in Russia.

ALEXANDRIA, a modern town of Dumfriesshire, 3 miles from Dumfries, on the railway to Glasgow. It owes its prosperity to the introduction of calico printing and dyeing. It is finely situated on the river Leven, and is well built and regularly laid out. The population in 1881 was 6616—an increase of 1600 from 1871.

ALEXANDRIAN CODEX, a manuscript of the Septuagint translation of the Bible in Greek, now preserved in the British Museum. It was sent by Cyrillus Lucaris, patriarch, first of Alexandria, then of Constantinople, to Charles I., was placed in the royal library in 1628, and continued there until that collection was removed to the British Museum in 1753. Its real age and value have been much controverted. These points have been minutely discussed by Dr. Woide, formerly librarian of the British Museum, in his preface to a facsimile edition of the New Testament. A second edition of the preface ("Notitia Codicis Alexandrini") was published by Spohn, who controverted many of Woide's opinions, showed that the MS. was by no means free from blunders of transcription, and reduced both its age and authority to a much lower standard.

The MS. is contained in four volumes, of the shape and size of large quarto, of which the New Testament fills the last. It is written on vellum, in double columns, in uncial or capital letters, without spaces between the words, accents, or marks of aspiration. The letters are round and well formed. Some words are abbreviated, but they are not very numerous. There is a variety both in the colour of the ink and the form of the letters. The MS. is on the whole in good condition.

The New Testament has been more fully described and more carefully collated than the Old, from which, however, Grabe published his splendid edition of the Septuagint, Oxford, 1717-20. The MS. is uniform in appearance and execution, but the Old Testament seems to be in rather better condition. It contains, besides all the canonical and most of the apocryphal books found in our editions, the third and fourth books of the Maccabees, the Epistle of Athanasius to Marcellinus, prefixed to the Psalms, and fourteen hymns, the eleventh in honour of the Virgin, Ecclesiastical, the Song of the Three Children, Susannah, and Bel and the Dragon, do not form part of the collection. The New Testament contains the genuine Epistle of Clement to the Corinthians, and part of the other which Euse-

been attributed to him. This is the only known manuscript in which the genuine epistle exists. A facsimile of the Old Testament portion was published by the Rev. H. Baber of the British Museum (London, 1816).

ALEXANDRIAN LIBRARY. A collection of books formed by Ptolemy, the first king of Egypt, and probably the largest which was made before the invention of printing. It is said to have been founded about B.C. 284, in consequence of the suggestions of Demetrius Phalereus, who had seen the public libraries at Athens. Demetrius was appointed superintendent of the new establishment, and busied himself diligently in collecting the literature of all nations, Jewish, Chaldee, Persian, Ethiopic, Egyptian, &c., as well as Greek and Latin. Eusebius says that at the death of Ptolemy Philadelphus there were 100,000 volumes in the library. It was situated in the quarter of Alexandria called Bruchion. Philadelphus purchased the library of Aristotle, and it was increased by his successors. Almost all the Ptolemies were patrons of learning; and at last the Alexandrian library is said to have amounted to 700,000 volumes. But the rolls (*codices*) spoken of contained far less than a printed volume; as, for instance, the "Metamorphoses" of Ovid, in fifteen books, would make fifteen volumes. This consideration will bring the number of books within the bounds of credulity.

In the siege of Alexandria by Julius Cæsar a large part of the library was burned. Gibbon (chap. xxviii.) asserts that the old library was totally consumed, and that the collection from Pergamum, which was presented by Mark Antony through Cleopatra, was the foundation of the new one, which continued to increase in size and reputation for four centuries, until, at the destruction of the Serapeion by Theophilus, patriarch of Alexandria, it was dispersed, A.D. 390. Still the library was re-established; and Alexandria continued to flourish as one of the chief seats of literature till it was conquered by the Arabs, A.D. 640. The library was then burned in consequence of the fanatic devotion of the Caliph Omar: "if they agreed with the Koran they were useless; if they disagreed with it they were useless." See OMAR.

Connected with the library of Bruchion was a college, or retreat for learned men, called the Museum, where they were maintained at the public expense. This establishment was subsequently transferred to the Serapeion, and continued to flourish till the destruction of the temple by Theophilus. The sciences of mathematics, astronomy, and geography were cultivated by Euclid, Apollonius, Eratosthenes, and Ptolemy the Geographer. Criticism, philology, and antiquities were also studied. (Gibbon, *Decline and Fall*, c. 51.)

ALEXANDRIAN SCHOOL. At the period when Greece was losing both her liberty and intellectual supremacy, the city of Alexandria became the centre of science and literature. After the death of Alexander, Ptolemy Soter, to whom this city had fallen in his portion of the empire, gathered around him a number of men famous for learning and philosophy, and gave them every encouragement in the pursuit of their studies. This liberal patronage was still further increased by his son Ptolemy Philadelphus, and the school of Alexandria thus became one of the great industries of the world. The time in which it flourished may be estimated at a period of about three centuries—from the reign of Ptolemy, 323 B.C., to the capture of the Arabs in 640 A.D. This is generally divided into two periods, the first extending from 323 B.C. to 100 A.D., and the second from 100 B.C. to 640 A.D. The first of these is the period of the school of science and poetry, and the second that of philosophy. In the latter a great attention was paid by the scholars of Alexandria to the preservation and explanation of the

existing writings of the Greek poets and philosophers, and to the study of poetry, astronomy, science, and medicine. The labours of the critics in the fields of language and literature have been of the highest value to succeeding scholars; and the works of Euclid, Eratosthenes, Hipparchus, and Archimedes greatly advanced the study of geometry, astronomy, geography, and mechanics.

In the second period the religious ideas of Judaism, which had been brought into Alexandria by the large colony of Jews resident there, largely modified the theories of the Greek philosophers; and the Jewish teachers, in their turn, endeavoured to reconcile their traditional beliefs with the most approved ideas of the Grecian schools. From this ferment, which was further increased by the introduction of Christianity, the systems of Neo-Platonism and Gnosticism took their rise, the first of which may be found most completely represented by Philo the Jew, who flourished at the commencement of the Christian era, while the influence of the latter may be traced in the works of Origen and other fathers of the church. The now distinctively Christian dogmas of the *Logos* (the Word) and the Trinity, are claimed by many philosophical historians for the Alexandrian Schools. It must not be forgotten that many of the early fathers were Alexandrian in thought. "For three centuries," says Lewes (*Hist. of Phil.*), "the Alexandrian School was a formidable rival to the greatest power that ever appeared on earth—the power of Christianity." It even triumphed for a few years, and in the person of the Emperor Julian (called the Apostate) it ruled the world. But at his death it sank, and after a brilliant flicker in the teaching of Proclus, who died in 485, it expired, and with it the ancient philosophy. ("Alexandria and her Schools," Kingsley; *Hist. de l'Ecole d'Alexandrie*, M. Jules Simon.)

ALEXANDRINE VERSE, a species of verse which originated in France at a very early period, and has become the regular heroic verse of the French language. It consists of twelve syllables, subject to the rule that its sixth syllable shall always terminate a word. The English Alexandrine verse consists in like manner of twelve syllables. The longest and most remarkable poetical work in our language, written wholly in Alexandrine verse, is Drayton's "Polyolbion." In general it is employed only occasionally in poems written in our usual heroic verse of ten syllables, and never except in the concluding line of the couplet or triplet. It also forms the closing line of what is called the Spenserian stanza. Regularly, it ought always, as in French, to be divisible into two hemistichs; but in the freer spirit of our poetry this rule is occasionally violated. Pope, in his "Essay on Criticism," characterizes it amusingly:—

"A needless Alexandrine ends the song,
That, like a wounded snake, drags its slow length along."

ALEXIS COMNENUS, Emperor of the East, ascended the throne in 1081, at which time the Seljuk Turks had spread from Persia to the Hellespont, the frontiers of the Danube were threatened by swarms of barbarians, and the Normans, who were masters of Apulia and Sicily, had attacked the provinces on the Adriatic; but the most important event of Alexis' reign is the passage of the crusaders through his dominions. His conduct on that occasion has given rise to the most conflicting statements by various historians. It is certain that he contrived with great skill to obtain as much advantage of their assistance against the Turks as he could, to guard himself against their obtaining any undue predominance over him, and evinced indifference if not neglect in forwarding their objects in Palestine. The Latin historians therefore accuse him of bad faith, whilst his daughter, Anna Comnena, who wrote her father's life in one of the

most interesting and valuable works of all Byzantine literature, extols his wise policy, dwelling with haughty indignation on the insolence and rapacity of the western barbarians. Alexis died in 1118, and was succeeded by his son, John Comnenus. The last of the Comneni was ANTONIUS. (Editions of Anna's history were published at Paris by Possinus in 1651, and by Schopen, at Bonn, in 1839.)

ALEXIS MICHAÏLOWITZ, born at Moscow in 1630, was a son of the Czar Michailo Feodorowitz Romanow, the first of that house which held the sceptre of Russia. At the death of his father, 12th July, 1615, he succeeded to the crown, and as he was still very young he was mainly guided by the advice of his councillors Morosow, his tutor, and Plessow, a judge of one of the high courts at Moscow. The avarice and despotism of these men caused an insurrection in Moscow in 1618, in which Plessow and several of their creatures were murdered.

The reign of Alexis was disturbed by two pretenders to the throne, of whom one was the celebrated Demetrius—the other was Ankudinow; and the support of their pretended claims by Poland led to a war with that country, in which the Russians were successful, and obtained the provinces of Smolensko, Tchernigow, and Serrveria. A war against Sweden, commenced in 1656, was unsuccessful; but a renewed conflict with Poland, which commenced in 1660 and lasted till 1667, resulted in the acquisition by Russia of a further portion of the Ukraine. In 1670 Alexis suppressed a formidable insurrection which had broken out among the Cossacks; and about 1673 he commenced hostilities against the Turks. He died, before a peace was concluded, on the 10th February, 1676, being then in his fortieth year.

Alexis Michailowitz did much for the improvement of Russia. Agriculture and manufactures were constant objects of his solicitude; he invited foreigners to settle in the country—especially artists, mechanics, and military men—whom he treated liberally. He ordered many works, particularly on applied mathematics, military science, tactics, fortification, geography, &c., to be translated into Russian; he enlarged the city of Moscow, and built two of its suburbs. He likewise completely reformed the Russian laws. He moreover commenced and partly effected an extensive ecclesiastical reform, chiefly in matters concerning the liturgy. Alexis was twice married; his first wife was Maria Ilyinichna Miloslawskoi, by whom he had five sons (two of whom, Feodor Alexeiewitz and Iwan Alexeiewitz, were his successors on the throne of Russia) and seven daughters. His second wife was Natalia Kirillowna Narishkin, by whom he had one son, Peter Alexeiewitz (Peter the Great), and one daughter, Natalia Alexeiewna.

ALEXIS PETROWITZ, the eldest son of Peter the Great of Russia, and of Eudoxia, the first wife of that monarch, was born at Moscow in the year 1695. As he grew up he manifested a decided opposition to the reforms introduced into Russia by his father; and in 1716, when only twenty-one, he secretly quitted Russia, proceeding first to Vienna and then to Naples. He was there induced to return to Russia, and to solicit his father's forgiveness; but Peter treated him with extreme harshness, compelled him to resign his pretensions to the crown, and finally had him tried and condemned to death. This was in the year 1718. The day after he was informed of his sentence Alexis was found dead in prison, and suspicions have been naturally enough entertained that a private execution accomplished the end, without incurring the risks or inconveniences of a public one. The prince whose unhappy career was thus terminated left a son, a child of three years old, who in 1727, on the death of Catharine I., became emperor under the title of Peter II. He reigned only three years.

ALFIERI, VITTORIO, was born at Asti, in

Piedmont, in 1749, of a noble and wealthy family. Vittorio at nine years of age was sent to the college of the nobles at Turin, and at thirteen was admitted to study philosophy in the university of the same city. At fourteen he entered the army, and before he was twenty visited France, England, and Holland. His life was, for several years after, restless and dissipated.

In 1773 he returned to Turin, and began to write some scenes of a drama on the subject of Cleopatra, his first essay in Italian versification. In 1777 he went first to Siena and then to Florence, where he applied himself seriously to dramatic composition. He there also made the acquaintance of the Countess of Albany, wife of Charles Edward Stuart, the Young Pretender. In 1782 Alfieri had completed fourteen tragedies, ten of which were printed at Siena. In 1785, the Countess of Albany having gone to live in France, Alfieri also repaired thither. Alfieri and the countess (whose husband died in 1788) were living at Paris when the French revolution drove them away. They returned to Florence, in which city he remained for the rest of his life. At forty-six years of age he began studying Greek, and by his own unassisted application he was enabled in two years to understand and translate the Greek writers. In complete retirement, pursuing his favourite studies, he lived till 1803 at Florence, where he died, at the age of fifty-five.

Alfieri gave to Italy the first tragedies deserving the name. The imities are strictly preserved, the characters are few, there are no subordinate incidents, and yet notwithstanding this meagreness there is so much power in the sentiments, nervy force in the language, and condensation of passion, that the performance of one of Alfieri's tragedies keeps an Italian audience spell-bound.

His minor works are numerous, both in prose and poetry. His autobiography is a most amusing book.

AL FINE or **AL SEGNO** (Italian for "to the end," "to the sign"), a term used when a part of a movement is repeated *al fine*, that is, up to the point marked by the word *fine* (end), or as far as the *sign* %, where in the repetition it stops.

ALFON'SINE or **ALONSINE TABLES**, an astronomical work which appeared in 1252, in the first year of the reign of Alfonso X. of Castile. A full account of their contents may be seen in Delambre, "Hist. de l'Ast. du Moyen Age," p. 218. Till the time of Copernicus and Tycho Brahe they continued in general use, being in truth a corrected body of Ptolemaean astronomy. Ptolemy's system being in itself inaccurate, the computed results of this system grew more and more inaccurate as time went on; and eleven centuries having now elapsed, the confusion between where the stars were and where they ought to be by theory was indescribable. Alfonso, in despair at the hopeless intricacy of cycles and epicycles, and their total disagreement with facts, exclaimed in an often-quoted phrase, "I could have done the creation better." He took the wise course of letting the theory alone, and forming at great cost this famous body of observations, necessarily, however, having reference to the system he felt to be so unnatural, since that was the only one he knew. The preparation of the tables occupied twelve years; and upwards of fifty astronomers were at one time in consultation over them.

ALFON'SO is the name of several kings of Spain and Portugal. This name is written by the Spaniards *Alfonso*, *Alfonso*, *Alphonso*, and *Alonso*, and by the Portuguese *Alfonso*. We have chosen the form *Alfonso*, as being that in most common use.

ALFONSO I., King of Portugal, was the son of Henry, count of Besançon, who held Portugal in fief with the title of count. At his father's death Alfonso was only two years old, and his mother governed in his minority; he was

forced subsequently to apply to arms and wrest the government from her. He defeated the Moors at Ourique in 1139, when the Portuguese historians state that they left 200,000 dead on the field. In the exultation of victory the count was proclaimed king by his followers.

In 1146 King Alfonso took the fortress of Santarem from the Saracens, and in the next year he took Lisbon, when the fleet of English crusaders, who were going to the Holy Land, rendered him very effectual assistance. In short, Alfonso freed almost all Portugal from the yoke of the Saracens.

Alfonso died in 1185 at Coimbra, in the ninety-first year of his age, and was succeeded by his son, Sancho I. (Brandan's "*Monarchia Lusitana*;" "*Chronicon Lusitanum*.")

ALFONSO III., surnamed *El Magno* (the Great), King of Leon, succeeded his father, Ordoño I., in 866, at the age of fourteen. Successful against his Christian enemies in the early part of his reign, Alfonso next turned his attention to the Mohammedans; and in thirty years of continual warfare his arms were always crowned with victory. He extended the boundaries of his empire to the banks of the Guadiana. But his own son Garcia, aided by the ever-rebellious barons, by his father-in-law the Count of Castile, by his brother Ordoño, governor of Galicia, and even by his own mother, attempted to dethrone the rightful monarch. Alfonso succeeded in crushing the rebellion and taking his son prisoner, but fearing the evils of a civil war he called a junta in 910, and abdicated the crown in favour of Garcia. The government of Galicia he intrusted to his second son Ordoño, and the youngest, Fruela, had that of Oviedo bequeathed to him. He died at Zamora in 912, having reigned forty-six years, and was a brave, just, and generous prince.

ALFONSO V. of Aragon, and I. of Sicily (surnamed the Magnanimous), succeeded in 1416 his father Ferdinand I., who had annexed the crown of Sicily to that of Aragon. To these two Alfonso added that of Naples in 1435, on the death of Queen Joanna II., who had adopted him for her heir and successor, though his claim was contested by René of Anjou, who was supported by the court of Rome and by Philip Maria Visconti, duke of Milan. After many vicissitudes, even including a temporary imprisonment of Alfonso at Genoa, René was driven from Naples in 1442, and retired to Provence, where he reigned till his death. Alfonso applied himself successfully to re-establish order and justice throughout the kingdom, which had long been a prey to misgovernment and confusion under the weak and corrupt reign of Joanna II. He was afterwards engaged in disputes with the popes, and in some other Italian wars, but on the whole favoured peace, and patronized art and literature. He collected a splendid library at a great expense, and caused translations to be made from the Greek of the works of Aristotle, Xenophon, &c. He also restored the aqueducts of Naples which supply the fountains with water, drained the neighbouring marshes, enlarged the mole and the arsenal, and raised the fine triumphal arch which forms the entrance of the Castelnuovo—then the king's palace. He died on the 17th of June, 1458.

Alfonso had no legitimate children, but he obtained a bull from the pope to legitimize his natural son Ferdinand, who succeeded him on the throne of Naples, while his brother John remained heir to the crowns of Aragon, Valencia, Sardinia, and Sicily. This John was afterwards succeeded by Ferdinand, called The Catholic, who reconquered the kingdom of Naples, which continued thenceforward a dependency of Spain for several centuries.

ALFONSO VI. was the son of Ferdinand I. He was crowned King of Leon in 1066. Ferdinand had committed the same fault as his father in dividing his states among

his children. He left Leon to Alfonso, Castile to Sancho, Galicia to Garcia, and the cities of Toro and Zamora to Urraca and Elvira, his two daughters. This produced a long civil war, during which Sancho was assassinated, and Garcia made and kept prisoner till his death. Having thus acquired so large a portion of the peninsula, Alfonso turned his arms against the Saracens. He invaded Portugal, and made most of the Moorish petty chiefs his tributaries. He afterwards took Coria, then attacked Toledo; and had not the Almoravides with a powerful army invaded Spain, he would have expelled the Moors from the peninsula. He gave his illegitimate daughter, Teresa, in marriage to Henry, count of Besançon, with his conquests in Portugal, and the title of count. During his reign the famous hero Rodrigo Diaz de Vivar, surnamed the Cid or Sidi (the Moorish word for lord), performed those exploits which have furnished abundance of materials to romance writers.

King Alfonso died in 1109 at Toledo, in the seventy-ninth year of his age and forty-third of his reign. He accomplished much in the consolidation of the Spanish kingdom, and was a man of strong and energetic character. His son Sancho having fallen in a battle against the Moors, the crowns of Leon and Castile fell to his eldest daughter Urraca.

ALFONSO X., surnamed *El Sabio* (the Wise), King of Castile and Leon, the son of Ferdinand III., called the Saint, was born in 1222. While crown prince he took the kingdom of Murcia from the Moors, and accompanied his father to the conquest of Seville. In 1252, on his father's death, he came to the throne. In 1256 he was proposed as a candidate for the empire of Germany; but though supported by the Elector of Saxony and the Archbishop of Treves, the project failed, and Rudolph of Hapsburg was elected.

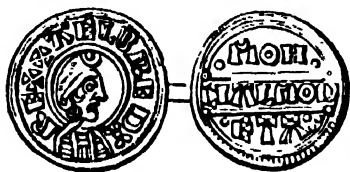
The Moors of Spain, having received considerable reinforcements from Africa, reconquered Xerez and other places in 1262; but their triumph was of short duration. In the following year Alfonso, with a considerable force, marched against them, defeated them in a succession of battles, and forced the King of Granada to do homage to Castile, and pay a considerable sum as an indemnification for the expenses of the war.

The latter part of his life was embittered by domestic strife. His son Sancho rebelled against him, and for a time he was deposed. There were many vicissitudes in the contest, and he always manifested great affection for his undutiful son; but at length, overpowered by misfortunes, he died on the 21st of April, 1284. In his will he expressed his desire that his grandchildren, the sons of Ferdinand, should succeed him, and in case of their death the King of France—making no mention of Sancho, who, however, succeeded him. Alfonso was buried at Seville. "He was the first king of Spain," says Mariana, "who ordered all public documents to be written in Spanish, with the view of polishing and enriching the language. He caused also the Bible to be translated. It is indeed astonishing," adds he, "that a king who had been brought up in war, and exercised in arms from his early youth, should be acquainted with astronomy, philosophy, alchemy, jurisprudence, and history to a degree scarcely attained by men enjoying a life of leisure, or having no other occupation than study." He has left as a monument of his learning, or of his patronage of learning, in his "*Chronica de España*," in the astronomical *ALFONSOINE TABLES*, in a code of laws denominated "*Las siete Partidas*," and in some poems and other productions which are still inedited. ("Chronica del Rey Don Alonso," in British Museum; Mariana, "*Historia de España*.")

ALFORD, HENRY, D.D., Dean of Canterbury, an eminent biblical scholar, critic, and philologist, and a poet of considerable merit, was born in London 7th October,

1810. He was first educated by his father, a clergyman of the Church of England, and afterwards at the grammar-school of Ilminster. At the age of seventeen he entered Trinity College, Cambridge, where he took his degree and entered the church. He was for eighteen years—from 1835 to 1853—vicar of Wyneswold, in Leicestershire, when he was removed to Quebec Street Chapel, London, and in 1857 was appointed Dean of Canterbury. He died 2nd January, 1871. His first publication was a collection of poems, entitled "Poems and Poetical Fragments," which was issued in 1833. He subsequently published "The School of the Heart, and other poems," in 1835; "Chapters on the Greek Poets," in 1841; and the same year his poem entitled "The Abbot of Muchelnaye." In 1841 he commenced a new edition of the Greek Testament, which he designed at first for the use of students, and hoped to complete it within a year. The study, however, opened out as he continued, and it finally engrossed his attention for a period of twenty years—the first volume being published in 1844, and the last in 1861. This was his greatest work, and it occupies the first rank among English editions. He also published a volume of sermons preached at Quebec Street Chapel, two books of family devotion—"The Year of Prayer" and "The Year of Praise"—and a little work entitled "A Plea for the Queen's English," which provoked some lively criticism. He was editor of the *Contemporary Review* from January, 1866, to August, 1870, and in the latter year he issued a collection of pen and pencil sketches of the Riviera, the latter being reproduced from his own water colour drawings by means of chromo-lithography. (See "Life, Letters, &c., of Henry Alfred, D.D.," London, 1873.)

ALFRED THE GREAT. This "best and greatest of all our kings" (Freeman) was born in the year 849, at the royal manor of *Wantage* (Wantago), in Berkshire. The proper Saxon spelling of the name is *Adfred*, as seen



in the engraving, which represents a coin in the British Museum.

Alfred's father was Ethelwolf, and his grandfather Egbert, both kings of the West Saxons; his mother was Osburh, a daughter of Osloc, who was raised by his son-in-law to an earl's rank. Ethelwolf had four sons—Ethelbald, Ethelbert, Ethelred, and Alfred; and one illegitimate son, Athelstan. Strictly these names are *Æthelwulf*, *Æthelberht*, &c., but we use the ordinary corrupt form. In the fifth year of his age Alfred was sent to Rome.

Asser, a Welsh priest, Alfred's biographer, states that his noble mind thirsted for knowledge from the very cradle; that he took delight in listening to Saxon poems, and got them by heart; and that when his mother offered to her sons a book of Saxon poems as a prize to him who first should learn them, Alfred instantly went to his tutor, read the book, and repeated its contents to his mother. It is a pity that so pretty a story should be shown by Mr. Freeman to be a mere myth. The work that bears Asser's name is unfortunately full of interpolations, not always so harmless as this one.

Frequent as foreign invasions had been during the reign of Ethelwolf, as well as during the two subsequent reigns of Ethelbald and Ethelbert, they became particularly formidable at the commencement of the reign of Ethelred (866),

when Alfred was eighteen years of age. At this early period Alfred seems to have been his brother's most valuable general.

The enemies with whom Alfred had to contend were the *DANES*. By this term ought to be understood all the Scandinavian nations, viz. Danes, Swedes, and Norwegians indiscriminately, who, because they at that period spoke a common language, the Norse (then called *Danish*, or *Donsk Tung* in foreign countries), went by the appellation which, strictly speaking, was peculiar to the most powerful of the Scandinavian tribes. From 866 to 871 he was constantly engaged with these daring and skilful enemies, with varying success.

Ethelred died shortly after Easter in 871, and, although there were young children of the late king, Alfred succeeded to the crown, being then twenty-three years of age. A month after his accession, though his forces were greatly inferior, he was compelled to a general engagement at Wilton with the whole army of the invaders. In the earlier part of the day he routed the enemy, but they at last kept the field; and during the three following years consolidated and recruited their power by more successful wars against other English rulers. Alfred's army was greatly reduced, and he could not now take the field with advantage. His embarrassments first suggested to him the idea of fitting out a fleet; and Alfred became the first founder of that naval power which in subsequent ages was to be an object of the world's dread and admiration. Alfred perceived that he had great advantages in fitting out a small flotilla to act in known seas, and on a dangerous coast (for most of the invaders landed between the Humber and the Thames), against invaders ill acquainted with its peculiar perils. The preservation of the West-Saxon monarchy was, in all probability, mainly owing to the existence of this small navy.

It is not within the province of this article to trace the military career of Alfred with that minuteness which more properly belongs to history. The Danes, under Guthrum or Guthrum, swore peace on their holy bracelet in 876. But this, the most sacred oath, they kept no better than the rest; and in 878, says the Chronicle, "they rode through the West Saxon's land, and there sat down, and mickle of the folk over sea they drove, and of the others the most deal they rode over; all but the King Alfred, he with a little band hardly gained the moor, woods, and fastnesses." St. Neot, his cousin, says that he for a time sought refuge with one of his cowherds, who, it seems, so faithfully kept his master's secret, that he did not even tell his wife that the king was their guest. One day, as he was sitting near the fire pointing arrows and making a bow, she set him to turn some cakes which she left on the fire: Alfred had more to think of than the cakes, and so they were burned. She chid him for that he was "good at eating cakes, but bad at turning." About Easter of the same year Alfred, with a few of his friends, took possession of a small island situated in the midst of a marsh formed by the stagnant waters of the Tone and Parret in Somersetshire, which the Saxons called *Æthelingas-ige*: its modern name is *Athelney*, or "the Royal Island." This inaccessible place he made still stronger by fortification, and thence made frequent excursions against the foreigners. It was from it, too, that, according to the well-known story, he reconnoitred the Danish camp disguised as a harper. At Ethandun (Edington) he fought a great battle with the army of the invaders, routed them, and pursued them to a stronghold, "and there sat fourteen nights." A great horse cut in the chalk hills to commemorate the victory is still there. The Danes capitulated; and King Guthrum, now christened Athelstan, and thirty chiefs of his army were baptized at a place near *Athelney*. Guthrum became a fairly faithful friend and vassal. The treaty of

Wedmore is still extant, wherein Guthrum and Alfred agree that a line by the Lea to Bedford and the Ouse and so by Watling Street shall separate Dane from Saxon. Alfred therefore kept Wessex and South Mercia.

Another invasion awaited Alfred in 893. The Northmen, under Hæsting or Hastings, landed upon the eastern coast, and were joined by the East Anglians and Northumbrians. Again the energy of the Saxon king repelled their attacks, after four years of danger and difficulty.

During the two last years of his reign Alfred seems to have enjoyed some tranquillity. He died on the 27th of October, 901, being fifty-two years of age, and having reigned twenty-nine years and six months.

Thus far goes the chronicle of Alfred's reign, or the bare recital of public events in which he acted for the most part as a leader, and where he always, in respect to talent, knowledge, policy, and character, maintains a lofty supremacy over his contemporaries. But he was as eminent in the cultivation of the arts of peace as in the struggles of warfare. He consolidated the Saxon monarchy; he built up and restored cities and towns, churches and monasteries; he compiled a code of laws; he organized the administration of justice; he was an indefatigable promoter of knowledge, himself translating into Saxon valuable Latin authors and portions of the holy scriptures, and annotating and explaining all that he translated; he began the great Chronicle, father of English histories; he encouraged the useful arts; he patronized travellers; he was the friend and correspondent of the most eminent scholars. He did all this with a feeble constitution, and under the sufferings of a chronic indolence. No man, king or subject, ever more thoroughly fulfilled his own ideal of life. "So long as I have lived," said Alfred in his later days, "I have striven to live worthily." On his death-bed he sighed forth his longing "to leave to the men that come after a remembrance of me in good works"—simple and noble words. Mr. Greville, in his "Short History of the English People," has summed up Alfred's character in one of his short pithy sentences—"He lived solely for the good of his people." In his twentieth year Alfred married Alswith, a daughter of Ethelred, ælde-man (earl) of the Gains in Lincolnshire. They had two sons—Edward, surnamed the Elder, who succeeded his father, and Ethelwald—and three daughters. A very interesting life of Alfred the Great, by Mr. Thomas Hughes, was published in 1870; but Mr. E. A. Freeman ("Old English History," &c.) is the great authority for this period.

ALFRETON, a town in Derbyshire, 14 miles N.E.E. of Derby, and 13½ from London by the Midland Railway. The inhabitants are engaged in the manufacture of stockings and pottery, or in the neighbouring collieries and ironworks. The houses of Alfreton are irregularly built, and some of them very old; the church, an ancient structure, has an embattled tower with pinnacles. The building was enlarged and the chancel rebuilt in 1869. There are three Dissenting chapels, and two banks. The population of the town in 1881 was 4192.

ALGÆ is the name given in the vegetable kingdom to plants living in the sea (sea-weeds), fresh water, stagnant pools, hot springs, and moist earth. Algæ belong to the great subdivision CRYPTOGAMIA, or flowerless plants, and are due to the section of cellular cryptogams in which the whole plant is made up of one or more simple cells, none of the cells combining, as some do in the vascular cryptogams, to form *vascular*. The nearest allies of the algæ are therefore the mosses, liverworts, charas, and fungi (including lichens), and the most difficult of these to separate are the fungi. It is well known that it is hardly possible to mark off by limits, clear and sharp, the boundary lines between various groups of living beings; and nowhere is this more apparent than when we attempt to draw the line between

fungi and algæ. Fungi are parasitic, or live on decaying matter; whereas algæ, as a rule, are not parasitic, though one has been found on duckweed. Perhaps a better separation (though still an artificial one) would be into those which contain the green colouring matter chlorophyll (algæ), and those which have none (fungi). The possession of chlorophyll implies that these plants are able, with the aid of light, to take up in the way of food such simple chemical compounds as carbonic acid (CO₂) and water (HO₂), and build these up into the more complex compounds which are found in every living thing. In many algæ this green colouring matter is concealed by other pigments, so that we find them bluish-green, violet, red, brown, and yellow. Amongst algæ are the very simplest forms of life. One of these is the Protoecoccus, found in shallow pools, roof-gutters, &c. When examined under the microscope it is seen to be a small grain (*cell*) consisting of a transparent bag (*cell-wall*), inclosing a semi-fluid and granular matter (*protoplasm*). A colouring matter, green or red, is diffused through the protoplasm or collected into granules. Some of the cells may be seen to be divided by a partition, and the two parts afterwards become separate cells. This division of cells is the type of all increase in size throughout the animal and vegetable kingdoms. The cell-wall, in its chemical nature, is a modification of starch called *cellulose*, and this kind of cell-wall is one of the distinctive marks by which we know that the Protoecoccus belongs to the vegetable kingdom. The green-coloured chlorophyll is another character, though it is by no means a certain criterion, any more than the presence of cellulose. The nature of its food, however, is a safe guide. It lives and multiplies in rain-water, and it is therefore out of the comparatively simple compounds, carbonic acid and ammonium salts, present in rain-water that it constructs protein. This building of complex chemical compounds out of the simpler is possible only for plants. While taking up carbonic acid it gives off oxygen in the presence of sunlight, wherein it differs from fungi but agrees with other plants. Protoecoccus does not form a tissue like higher beings, but very often it becomes locomotive by putting out from the cell-wall two threads (*cilia*), which vibrate so rapidly that they can only be seen when they move slowly through the addition to the water of some reagent. The nature of this simple form has been somewhat fully entered into, as it has so much in common with higher algæ. Diatoms (fig. 1, Plate ALGÆ) live in enormous numbers both in fresh and salt water. The cell-wall is very remarkable in being composed of silica, and these transparent flint coverings form beautiful microscopic objects. They are found fossil in immense quantities in Bohemia, where a single layer, 14 feet thick, stretches over a wide area. Each diatom is so small that, according to Ehrenberg's computation, there are 41,000 millions in every cubic inch of the stone, of which use is made for polishing stones and metals. Diatoms are found in ice-cold water and also in hot springs, and are more widely distributed than any other living thing. The Nostocs (fig. 2) form strings of cells, inclosed in gelatinous sheaths. By the melting of the sheaths the necklace-like strings are united into masses of jelly. They occur in fresh and brackish water and on damp earth, often suddenly appearing on pathways after a shower of rain. In *Spirogyra* (fig. 4) the cells also form threads. It is so named from the spiral twist of the bands of the chlorophyll. The cells are apparently all alike, and reproduction takes place by the union of two cells in separate threads. *Vaucheria* (fig. 6) forms dark-green tufts of threads in water or damp earth, and often infest greenhouses. Each thread is a single cell, and is branched. Asexual reproduction takes place by the detachment of ends of branches as spores, which after a short time germinate, or by the end of a branch being formed into a

spore-case containing several spores, or zoospores, that swim by means of vibratile cilia. Sexual reproduction is effected by the formation of antheridia (male cells) and oogonia (female cells) on the same branch. The genus *Fucus*, to which fig. 11 (*Fucus vesiculosus*, bladderwrack) belongs, is extremely common on our coasts. These sea-weeds are asexual, with a flat and forked frond; the air-cavities are formed by a swelling either of a whole branch or of a portion; there are also cavities filled with a glutinous substance. The antheridia and oogonia are placed in hollows crowded together at the ends of branches. The oospores escape from the hollows, and are fertilized by the spermatozooids outside the plant. *Batrachospermum atrum* (fig. 3) belongs to the group *Florideæ*. It is black, and grows in fresh water, whereas almost all the other genera of this group are inhabitants of the sea, and have the green colour of the chlorophyll concealed by a red pigment. The spermatozooids are not motile, and the oospores are contained in a capsular fruit, formed after fertilization. *Batrachospermum moniliforme* is common in streams, and forms a beautiful object for the microscope. *Polysiphonia fastigiata* (fig. 5) is one of those algæ which have rose-coloured spores. It is found growing on *Fucus nodosus*. The fronds are thread-shaped and jointed, and have a striped appearance, from the cells on the surface being arranged in transverse rows. *Polyides rotundus* (fig. 7) has large, conical, rose-coloured spores attached at the small end, many together, radiating from a single point. This alga occurs on our coasts, forming a spongy mass of jointed threads. *Gigartina mammillata* (fig. 8) is found amongst *Chondrus crispus* (carageen). The branching fronds are made up of numerous threads encased in a firm jelly-like substance. The spores occur in roundish masses in external capsules. *Padina pavonia* (fig. 9) is the turkey-feather laver, or peacock's-tail. It is a native of the tropics, but reaches the southern shores of Britain.

From a consideration of a few algæ such as the above, some notion may be gained of the great diversity existing in the class with regard to development. In the first place, the *differentiation of the individual cell* is very varied. The simple protoplasm forms a nucleus in the lowest kinds and chlorophyll grains or bands in higher algæ. The cell-wall is often changed into mucilage, or strengthened by the deposition of silica or of carbonate of lime (e.g. in *Coralina*). The *mode of combination of the cells* with one another varies more than in any other class. Protococcus and other simple kinds, after cell-division, separate; in others the cells remain connected, forming a row, or plate, or mass. The row of cells in *Nostoc* forms a mucilaginous sheath, and joins with other rows into a mass. In *Hydrodictyon* (water net) the cells are at first isolated, and then unite to form a net. In some *Florideæ*, also in *Fucus* and other large sea-weeds, a solid tissue is formed, but with scarcely any difference of size in the cells and no combination into vessels, such as occur in higher plants. The first evidence of an *external differentiation into organs* is noticed where the alga forms a row of cells, as in *Spirogyra*. A higher step is reached when branching takes place; and this passes gradually into forms where branches put on an appearance of the leaves and roots of flowering plants, though, their functions not being the same, they require new names. A most remarkable example of this differentiation into root-like and leaf-like appendages is to be found in *Caulerpa*, which consists of a single cell without any transverse divisions; but yet the walls of the cell grow out in various directions, until we have a plant 2 feet long, with stem, leaves, and roots. The *mode of reproduction* may be either asexual or sexual. Asexual occurs in all; sexual reproduction has not at present been ascertained to occur in all groups. The asexual reproductive cells (*spores*) are, when separated from the parent plant, either

motionless, as the *tetraspores* of the *Florideæ*, or motile, when they are called *zoospores*. The motion of the zoospores is caused by the vibration of fine threads (*cilia*). After the spores have settled down they germinate, and grow up into a perfect plant.

ALGAROTTI, FRANCESCO, was born at Venice in 1712. His father was a wealthy merchant. At the age of twenty-one he wrote an explanation of the system of Newton, adapted to the taste and understanding of female students. Having become acquainted with Frederick the Great of Prussia when he was living in retirement as Crown Prince, Algarotti, after the accession of Frederick to the throne, was invited to his court; and he remained afterwards in the Prussian capital or at Potsdam the greater part of his life, as the friend and confidant of Frederick. Towards the latter part of his life Algarotti, finding the climate of Prussia too cold for his declining health, returned to Italy. He died at Pisa in 1764, in his fifty-second year. Algarotti was the friend and correspondent of most of the literary men and women of his time—Voltaire, Maupertuis, Metastasio, Lord Chesterfield, Lady Wortley Montagu, &c. His chief merit is that of having rendered science and literature fashionable among the upper classes of his age and country. Carlyle ("Frederick the Great," xi. 3) pitifully sketches "Friend Algarotti—one of the first beaux-esprits of this age, as Wilhelmina defines him—full of elegant logic, has speculations on the great world and the little, on Nature, Art, Papistry, Anti-papistry, and takes up the Opera in an earnest manner as capable of being a school of virtue and the moral sublime. His respectable books on the Opera and other topics are now all forgotten, and cannot to be mentioned."

ALGARVE, the most southern province of Portugal, is bounded N. by the Sierras of Mouchique and Caldeira, which separate it from Alentejo, E. by the Guadiana, S. and W. by the Atlantic Ocean. Its length, from Castromarin to Cape St. Vincent (the south-western extremity of Europe), is 96 miles; its mean breadth, about 24 miles. The area is 1873 square miles; the population in 1882 was 190,000.

The mountainous districts, which occupy more than two-thirds of the surface of the province, are but thinly inhabited; the land is unfavourable to agriculture, but goats are reared. The narrow strip along the coast has a comparatively dense population, and being protected by its boundary of mountains from the cold winds of the north, it produces the fig, citron, almond, date, lemon, orange, olive, vine, and the carob, or St. John's bread tree, in the highest perfection. The extent of sea coast, amounting to more than 120 miles, has also given a maritime character to the inhabitants, who benefit largely by the periodical visits of the pike and from the northern seas, and the tunny and sardine from the Mediterranean—the sea marshes near Castromarin on the Guadiana furnishing the requisite salt for their preservation. These fisheries, together with wine, dried fruits, and salt, furnish the principal exports. The fishermen supply the navy of Portugal with her most valuable sailors. The chief towns are Faro, Tavira, and Lagos. The name Algarve is Arabic, and means "a land lying to the west." Until 1253 it was a Moorish province, when Alphonso III., king of Portugal, united it to the crown, and assumed the further title of king of Algarve.

AL'GEBRA. This word is derived by contraction from the Arabic phrase *al gibr al mokābala*, the nearest English translation of which is *restoration and reduction*. So short a definition is of course useless. We shall endeavour to give the first and most simple view of this science, our limits not permitting us to go, even in the smallest degree, into its operations.

In establishing the rules of arithmetic it is always

necessary to use general reasoning; that is, reasoning the nature of which would not be altered if other numbers had been chosen different from those which were really employed in the question. If therefore we use symbols instead of figures the effect will be exactly the same, provided we translate our symbols correctly at the end of the process. Thus, if $a = 4$ and $b = 2$, $a \times b$ (usually written simply ab) $= 8$, since this is merely another mode of representing 4×2 . It is evident that we gain at once two immense advantages; first, the power of expressing shortly and clearly any general truths of numbers (as rules of arithmetic, &c.) by our symbols, which of course hold good for whatever special value we may please to give them; and secondly, the advantage of tracing the action of any factor throughout the whole process, whereas in arithmetic the factors are lost. Thus ab always means $a \times b$, and however it may be multiplied, or divided, or added to, or taken from, it clearly shows its original character; but if we take the values of a and b given above, namely, 4 and 2, so that $ab = 8$, this figure 8 bears no mark of its origin, and if we deal with it in any way, as for instance, if we add to it, it acquires another appearance, and we cannot retrace it to its source. We are powerless, therefore, to detect the influence of one of the factors (say the number 4) unless we note it at every step we take, whereas by the use of symbols it is obvious throughout.

Our space forbids us to do more than thus to indicate the general nature of the art; for further information we refer the reader to one of the works mentioned below.

The earliest treatise on algebra of which we can fix the date is that of Diophantus, an Alexandrian Greek, who is generally supposed to have lived about the middle of the fourth century of the Christian era. It is very unlike a modern treatise on algebra and consists altogether of a species of problems which have since received the name of *Diophantine*, in which it is required to solve certain questions, the answers to which shall be whole numbers only. It is so like the Hindu algebra in its character that it is impossible to suppose the two wholly unconnected. See *VIGNA GASTIA*.

The Persians and Arabs confessedly derived their knowledge of the subject from the Hindus. We do not, however, find that they proceeded as far as their masters; for the Arabs, to rise, so far as we know, contain only the solution of equations of the first and second degree, and their application to various arithmetical questions, excluding all mention of indeterminate equations.

It was by means of the treatise of Mohammed Ben Musa, who lived in the time of the Caliph Al Mamun, that the science was introduced into Europe. A complete and able translation of this work by Dr. Rosen, with the original Arabic, was published in 1831 by the Oriental Translation Fund.

This science of the science was introduced into Europe, or at least into Italy only, at the beginning of the thirteenth century, by Leonardo Bonacci of Pisa. Algebra lay dormant in Italy, without receiving any material improvement, till the middle of the sixteenth century, when it was introduced into Germany, France, and England, nearly about the same time, by STEF. PELLÉRIER, and ROBERT REYSCUS respectively. The Hindus, instead of using the letters of the alphabet, designated various unknown quantities by the names of different colours; the Persians and Arabs employed the word answering to "thing" in the language for the unknown quantity, and the Italians adopted the word "*cosa*" for the same purpose; hence algebra came to be called the *regola de la cosa* in Italy, and the *cosile art* in England. It is to be observed, however, that in no country, up to the time of Vieta, were general symbols used to signify anything but quantities & right; thus *c* given being always certain numbers, and

never arbitrary representations of numbers in general. Hence the simple word "thing," or any abbreviation of it, was sufficient for their purpose.

While algebra was being introduced into the various countries of Europe, the Italians began to make the first steps towards its improvement. The solution of an equation of the third degree was discovered by Cardan and Tartaglia; that of the fourth by Ferrari; while various other discoveries were made by Bombelli and Maurolico. We must refer the reader to the several lives of these mathematicians. Vieta, a Frenchman, in 1600 made the grand improvement of using symbols to stand for known as well as unknown quantities, and, with the additional power derived from this improvement, laid the first steps of the general theory of equations. In England Harriot, in 1631, carried on and extended the discoveries of Vieta; and from the time of the two latter we must date the modern form of the science.

Our limits will not allow us even to name the crowd of discoverers who have extended this branch of pure mathematics since the time of Vieta. We must refer to the work of Hutton, "Mathematical Tracts," to Bossuet's "Histoire des Mathématiques," or to the histories of Montucla, Cossali, and Libri. The reader may also consult the works of Euler, Lagrange, Maclaurin, Peacock, and De Morgan. Bishop Colenso's "Elements" is an excellent treatise on the simple algebra of everyday use.

The science of algebra, which commenced its existence as a generalization of arithmetic, was soon embarrassed by the well-known difficulties of *negative quantities* and *impossible quantities*. The answer to a problem would frequently appear in the form of an impossible subtraction, such as $3 - 8$ or $0 - 12$. In such cases it was soon seen that for the most part (for that it is always so was not made clear at first) such answers arise from having looked for the result in a wrong direction. Thus, in a question of time, if the answer, supposed to be hours *after* a certain epoch, present itself as $3 - 8$ or as $0 - 12$, it is a sign that it should be $8 - 3$ or $12 - 0$ hours *before* that epoch. This interpretation, combined with the discovery that the forms which require it may be used by the same rules as those which are arithmetically intelligible, makes the transition from pure arithmetical algebra to one of positive and negative quantities present no very great difficulty. And the signs $+$ and $-$, instead of being looked on as standing for addition and subtraction, must be considered as merely implying opposition of meaning; whatever $+ 1$ may stand for, $- 1$ stands for as much of the diametrically opposite kind.

When this difficulty was settled there arose another, namely, that even in the algebra of positive and negative quantities the *square root* of a negative quantity was found to have no existence. It is only in recent times that a fair insight into the state of the case with respect to this difficulty has been arrived at.

The representation of truths by means of *symbols* is a language, and every language has rules of structure which constitute its syntax. These rules are not necessarily entirely dependent on the meaning of the words in the mind of a student, whatever may have been their original derivation. That it is *homo loquitur* and not *homo loquuntur*, does not depend upon *homo* meaning a man rather than anything else, but upon *homo* meaning *one* man rather than *two* or more. In a similar manner the structure of algebraical language has a syntax, the forms of which are frequently dependent upon a part and not the whole of the meaning. For example, the laws of addition in arithmetic are found not to depend upon the *whole* notion of number. To count $6 + 8$, as written, is to go through the process of forming 8, only making 6 a beginning instead of 0. And it is a sufficient direction to form

$a + b$, still in arithmetic, if we say "proceed from a in the same manner as you proceed from 0 in forming b ." Here number is not mentioned, nor even alluded to; and it may be perfectly possible to obey the preceding direction in a case in which a and b do not stand for numbers, and the process of formation is not counting.

When the rules of algebra are separated, and with them only such parts of their meaning as are essential to their description, it is found that the same rules, under the same descriptions, may and do admit of being deduced from other notions of magnitude, of which number is only a part. For example, simple length is connected with number, but length admits of an infinite number of modifications which are independent of number; which we express by saying that a line of a given number, say of feet, may

take an infinite number of different directions. On this subject-matter, namely, length considered as having a definite direction, is founded *one* algebra; and this algebra is found to give no difficulty about the square root of its negative quantity. Some idea of the reason why may be given as follows:—

To multiply by 49, the square of 7, is to multiply twice following by 7; and if 10 had a finite square root, it would be because there would be a fraction the multiplying twice by which would be equivalent to one multiplication by 10. If it be the structural property of $\sqrt{-1}$, that $\sqrt{-1} \times \sqrt{-1}$ is the same as -1 , it follows that we impose upon multiplication by $\sqrt{-1}$ the necessity of standing for an operation which, repeated twice, changes the magnitude under consideration into its opposite, without



Algeciras and Bay of Gibraltar, from the old Moorish Castle.

destroying it at the first step; for other conditions, which it is equally necessary to satisfy, prevent $\sqrt{-1}a$ from being 0, except when a is 0. Now in considering length affected by direction, we have a distinct conception of such an operation; for the turning of a line through a right angle is a process which, repeated a second time, turns the line a into the directly opposite line signified by $-a$. And it is found that, in this system of algebra, $\sqrt{-1}a$ must be interpreted as a line, having a direction at right angles to that of the line represented by a .

This system, when new, had of course some opposition to encounter, but very little, all things considered. Some of it arose from the idea that its supporters meant to contend that the above interpretation is the only one, and that algebra, for complete explanation, must be founded on the joint notion of length and direction. But no such

assertion is made. If any one will undertake to assign a commercial process of such a kind, that one process changes a gain (without destroying it) into something distinctly conceivable as neither gain nor loss, but something intermediate, and the second process turns that intermediate state into a loss—then those who take the widest view of algebra are prepared to adapt the system to business, and see the way in which it can be done. And the same with respect to other ideas of magnitude.

ALGECIRAS, a seaport town of Spain, in the province of Cadiz, finely situated on the western side of the Bay of Gibraltar, which is about 6 miles across. Population, 15,000. The town is supplied with water by an aqueduct, and possesses a dockyard, a military hospital, and the ruins of a Moorish castle. There are several manufactures, such as cotton, paper, and copper articles; and

though the harbour accommodation is not good, considerable trade is carried on. The chief exports are tanned leather and charcoal. Algéiras, the first town in Spain occupied by the Moors, in 711, was taken from them by King Alfonso the Avenger in 1344, after a siege of twenty months, in which he was aided by crusaders from all parts. The city, which was then destroyed, was not rebuilt until 1760. Gunpowder is said to have been first used here in Europe by the Moors. This place was the centre of the Spanish operations against Gibraltar, 1780-82; and in July, 1801, the English admiral Saumarez sustained a reverse from the combined fleets of France and Spain, which, however, a few days afterwards he turned into a substantial victory. The name is Arabic, and means "the Island." It was known as *Portus Albus* by the Romans.

ALGERIA (French, *L'Algérie*), a country of North Africa, forming part of Barbary, is the largest of the French colonial possessions. It is bounded by Tunis on the east, by Morocco on the west, by the great desert of Sahara on the south, and by the Mediterranean on the north. Its greatest length is about 600 miles; its breadth cannot be stated with precision, but varies from 100 to 300 miles. The total area, as given in the official returns, is 165,500 square miles.

Surface and Climate.—The chain of the Atlas Mountains runs through the whole length of the country; and its various ridges, with the intervening valleys, occupy the greater part of its surface. A central ridge, or succession of ridges, marks the boundary between the Tell, or country fit for tillage (formerly one of the granaries of Rome), and the Sahara, and divides the waters that run into the Mediterranean from those that flow southward and lose themselves in the marshy lakes of the interior. This ridge contains a few lofty peaks often covered with snow, among which are two supposed to have been known to the ancients as *Mons Zalucus* and *Mons Ferratus*. Besides the Great Atlas, another group, known to geographers by the name of Little or Maritime Atlas, rises nearer the sea. The coast is mostly rocky and steep, but in some places there are flat plains intervening between the mountain ranges and the shore, the most extensive and important of which is Metidja in the immediate neighbourhood of Algiers. There is a scarcity of good harbours and anchorage.

The principal river of Algeria is the Shelif, which has its sources within the borders of the Sahara, and after a course of between 300 and 400 miles reaches the sea near Mostaganem. The other rivers are the Seybouse, 120 miles in length, the Sournou, and the Rounel, besides several of less importance. On account of their swiftness, and the rocky character of their course, they are of but little use in navigation. During the rainy season they overflow and cause considerable interruption to communication. Extensive lakes and marshes prevail, as well as several warm mineral springs. The marshes usually dry up in summer and leave a deposit of salt; many in the vicinity of towns have been drained by the French.

The climate of Algeria naturally varies according to the nature of the country, for while near the sea it is tempered by the breeze, the heat in the inland districts is very great. Heavy rains are of frequent occurrence on the coast during the winter months—December to February; this period is succeeded by the temperate season, and then from July to November by the hot season. In May and the four following months the simoon, or hot wind of the desert, is prevalent, and carries about an extremely fine, penetrating sand. There is great difference between day and night temperature in summer; but, generally speaking, the climate is healthy, except in marshy districts, and resembles that of southern Spain. Ophthalmia prevails to a great extent.

Animals, Products, Trade, &c.—Among the wild animals of Algeria are the panther, jackal, boar, antelope, and monkey; the lion is becoming very scarce. Of birds there are the eagle, owl, snipe, and other water-fowl, and in the desert the ostrich. Tortoises, lizards, and serpents are found; and the locusts, which abound, often inflict serious damage on the crops. The beasts of burden are the camel, ass, and mule—the fine horses of the country being employed for riding. Large flocks of sheep and goats are reared by the Arabs.

The forests furnish oak, pine, cedar, cork, and other trees. Much injury has been caused to the woods by the practice of burning the grass in order to clear the country. Ores of iron, copper, lead, zinc, and manganese are worked with advantage, and extensive deposits of rock-salt occur. Coral and sponge fisheries are extensively carried on along the coast.

The fertility for which Algeria was renowned in ancient times still continues. Great benefits have resulted in dry regions from the sinking of Artesian wells by the government. The hills are covered with fruit trees of every kind, which also abound in the region of the Sahara villages, especially the date-palm tree. The sugar-cane grows; and the cultivation of cotton is of long standing. The mulberry tree flourishes readily in various parts, and the *ricin* of Japan has also been introduced for the support of the silkworm. The *Eucalyptus globulus* (blue gum tree) has been imported from Australia, with very successful results. The grain raised includes wheat, barley, Indian corn, millet, doura, and also rice.

The manufacture of essential oil for scents has attained considerable proportions; tobacco is largely grown, and is very profitable, the government being the chief purchaser, for consumption in France. The most important vegetable production, however, is the *alfa* fibre, or esparto grass, extensively used in the manufacture of paper, which grows spontaneously over vast tracts of country where cultivation of any description is almost impossible, and covers an area of 10,000,000 acres. The extent of land sown in wheat is annually increasing, and the yearly yield is now over 20,000,000 qrs. The culture of the vine is also rapidly extending. In a recent report from the British consul in Algeria it was pointed out that, owing to its special adaptation for the culture of the grape, Algeria promises to become one of the finest wine-growing countries in the world. A new industry in the shape of ostrich farming has lately sprung up, and promises to be attended with important results.

The imports of Algeria increased from £3,000,000 in 1850 to £8,000,000 in 1882, and the exports from £800,000 to £3,000,000 in the same period. About four-fifths of the total commerce is with France. The exports consist chiefly of cattle, flour, skins, wool, olive-oil, tobacco, and ores, also a kind of fibre, known as *crin vegetal*, produced from the dwarf palm, and the *alfa* fibre previously referred to. The imports are wines and spirits, grain, cheese, sugar, soap, glass, cotton goods, and coal.

Inhabitants.—Besides the French colonists and other European settlers, the races which inhabit the territory of Algeria consist of eight distinct tribes. 1. The *Kabyls* or *Berbers* are descendants of the aborigines, and form a great part of the whole population. They chiefly inhabit the more elevated regions. A description of them will be found under **BERBERS**. 2. The *Arabs*, a large class, live principally in the southern part of the country. The majority of them belong to the Bedouin tribe, and from their nomadic and turbulent nature are a source of trouble to the colony. Their habits and customs resemble those of the Arabs described under **ARABIA**. 3. The *Moors*, a mixed race, are found in the towns and villages near the sea-coast. 4. The *Turks*, who for more than three

centuries were the rulers of Algiers, were never a large body, and since the occupation of the country by the French have almost disappeared. 5. The *Koulougis*, the offspring of Turks by Arab or Christian women, are said to amount to 17,000 in the city of Algiers alone. Some of them belong to the native militia; others are employed in various offices under government; many are possessed of property, which their fathers or themselves have acquired. 6. The *Jews* came in great numbers to Algiers on being driven out of Spain and Portugal in the fifteenth century. There are estimated to be between 40,000 and 50,000 living in the principal towns, chiefly on the coast. They form the great mercantile class, and under the French have enjoyed the security of life and property which was formerly often denied them. 7. The *Negroes* were formerly slaves brought from Soudan by the caravans, or kidnapped by the Bedonins of the desert, but slavery is now no longer tolerated. 8. The *Mozabites* or *Biskeris*, an African race found on the coast; they are generally honest, peaceful, and industrious.

Divisions and Towns.—Algiers, or that portion of it which is settled, is divided into three provinces, Algiers, Oran, and Constantine, under the control of a civil governor-general and council. These provinces are each again subdivided into four departments, at the head of each of which is a prefect. The governor has the power to legislate and to control military affairs, and the less civilized parts are still under military rule. The principal towns are Algiers, Constantine, Bona, Oran, and Tlemsin. The country south of the Atlas comprises two districts, the Zaab and the Wad Reag. The Zaab (ancient *Gætulia*) contains many villages inhabited by an industrious population of Arab stock. The Wad Reag contains a group of villages inhabited by Kabyles.

History and Progress.—The territory of Algeria includes the several divisions of ancient Numidia, both of the Massyli and of the Massesyli, the kingdoms of Massinissa and his rival Syphax, and afterwards of Jugurtha. It also includes part of the Mauritanian kingdom of Boetius and of Juba. It was conquered successively by the Romans, the Vandals, the Byzantine Greeks, and lastly by the Arabs, who invaded North Africa at the beginning of the eighth century, and established Islamism. Ferdinand the Catholic, after driving the Moors from Spain, sent an expedition to Africa under Cardinal Ximenes and Don Pedro Navarro, which took possession of Oran and Marsa el Kehir in 1509, and of Bujeiah in the following year. The Moors then called in the aid of a Turkish corsair, named Horush Barbarossa, who, after vanquishing the Spaniards, claimed possession of Algiers itself. The country in 1519 became a province of Turkey, governed by a pasha or regent appointed by the sultan. The first who filled this office was Khair-ed-din, the brother of Horush. He manned a large fleet, with which he swept the Mediterranean, striking terror among the Christian sailors. Solyman I. called him to Constantinople, and raised him to the rank of Capudan Pasha, or Great Admiral. Hassan, a Sardinian renegade, who succeeded him in the regency of Algeria, confined to scour the sea, and make incursions on the coast of Spain. Charles V., in the plenitude of his power, was baffled in his attack upon Algiers in 1541. A terrible storm dispersed his fleet, and the army was obliged to re-embark in the greatest confusion. From that epoch the Algerines thought themselves invincible; they extended their piracies not only all over the Mediterranean, but also into the Atlantic, and seized the vessels of all nations who did not agree to pay them a tribute.

Robert Blake, in 1655, first taught the Algerines to respect the English flag. Louis XIV. caused Algiers to be bombarded in 1682 by Admiral Duquesne, which

led to a peace in the following year between the two countries. The Spaniards, under General O'Reilly, landed near Algiers in 1775, but were obliged to re-embark in haste and with loss. The Dutch, after several combats with the Algerines, by paying a sum of money obtained respect for their flag. So likewise did the Danes and Swedes. The Austrian and Russian flags were protected by the special interference of the Porte, in consequence of treaties with the latter. But the Italian states were the greatest sufferers from the piracies of the Algerines and the other Barbary powers, who not only seized their vessels and cargoes, but made slaves of all on board, who were either sold in the market, or sent in chains to the public works. In 1815 the Algerine power was checked by its lawless exactions by the ships of the United States, which captured a frigate and brig; the dey was also compelled to conclude a treaty with the Americans, renounce all tribute, and pay them 60,000 dollars as compensation for the ships that had been plundered. Lord Exmouth, in execution of the determination taken by the congress of Vienna, put an end to Christian slavery in 1816 by bombarding the city of Algiers, and bringing the dey to terms on this and other subjects. A better state of things lasted for about eleven years, when an insult offered by Hussein Pasha, the last dey, to the French consul, in April, 1827, induced the French government to send an expedition on a very large scale to take possession of Algiers. This was effected in June, 1830. Algiers capitulated to General Bourmont; the dey abdicated, and retired to Europe; and the French took possession of the town, of the fleet, and of the treasury, where they found above £2,000,000 sterling in precious metals and stores.

By the capitulation of the 4th of July, 1830, the French became possessed "of the city of Algiers, and the forts and harbours depending on it." No mention was made of the provinces, or of the native tribes, over which the authority of the dey was little else than nominal. It is from this circumstance that the French have lost so much blood and treasure in extending their possessions of the country. The Moors inhabiting the town of Algiers, Oran, and Bona, became subjects of France; but the Arabs and Kabyles of the open country followed their own tactics; and even the Turkish beys of provinces showed a disposition to join with the Arabs and Kabyles rather than with the French invaders. A kind of guerilla warfare then ensued, which was carried on with varying intensity for about seventeen years, marked occasionally by inhuman atrocities on the part of the Arabs, and by proceedings little less discreditable on the part of the French. The most formidable antagonist to the French generals was the celebrated Abd-el-Kader, the bey of Mascara, who exhibited great military talent, and inflicted very severe losses upon the invaders of his country. It was not till December, 1847, when Abd-el-Kader, pressed and hemmed in on all sides, yielded himself a prisoner to General Lamoricière, that the conquest of Algeria could be said to be effected, having cost an expenditure of blood and treasure utterly out of comparison to the trifling worth of the colony to France. [See ABD-EL-KADER.] Even after the removal of the great Arab chief numerous outbreaks of the natives occurred; and to hold this country, with its native population of 2,000,000, required as many European soldiers as were maintained in India by England. The force usually kept in Algeria was 60,000 men, and it was said that if the country was rather an expensive luxury than a profitable colony to France, it at any rate served as an excellent military school where new levies were quickly converted into veterans. In case of an European war, the African army was supposed to be a valuable reserve of well-disciplined soldiers inured to campaigning. Experience showed the fallacy of this notion, and the struggle with

Germany in 1870-71 abundantly demonstrated the fact that desultory warfare with savages, resulting in easy victories, was the very worst school of training the French soldier could have.

The Arabs and Kabyles took advantage of the complications of the French, and broke out in 1871 in widespread revolt; but after its suppression Algeria entered upon a fairly promising career of civilization, and instead of an essentially military rule, a new organization has been established, which comprises all the usual features of the French government. If, as is said, the country has cost France 150,000 men and fully £200,000,000 more than the revenue derived from it, it is at all events a great gain to the world to have transformed a nest of pirates and robbers into a really fine colony with ports, fortifications, public buildings of all kinds, roads, railways, villages, cities, abundance of cleared and fertile land, irrigation works, and mines of immense value. After the cession of Alsace and Lorraine, emigration from those districts was encouraged by free grants of land with satisfactory results.

The European population increased from 192,000 in 1861 to 312,000 in 1881. The number of natives is about 4,600,000, of whom no less than 2,500,000 consist of wandering Arab tribes. Of the European population only about one-half are French. About 700 miles of railway are completed, and 500 more are in course of construction or planned.

In 1877 a very interesting and satisfactory report on the state of the colony was issued by the governor, General Chanzy, who considered that the object of the French government should be the eventual transformation of the entire colony into a civil territory. On the accession of M. Jules Grevy in 1879 as president of the French Republic, this idea was carried out to some extent, and a civil governor was placed at the head of both civil and military authorities. The French magistracy are gaining more and more the confidence of the natives; the Arabs also voluntarily send their children to the primary schools, and those who have means place them in the French lycées and higher schools.

ALGERO, a town on the west coast of the island of Sicily, in the province of Sassari, about 15 miles south of the town of that name. It stands on the shore of a spacious bay, and is surrounded by stout walls, flanked with bastions and towers. The town, however, is commanded by the neighbouring hills. Algéro contains a cathedral, several churches, convents, and public schools, and is also the seat of a bishop. Inside the town the water-supply is obtained from cisterns, and in the vicinity there are some fine grottoes. The most beautiful coral of the Mediterranean, and the best wine of the island, are exported from Algéro, together with tobacco, grain, wool, and olives. The anchorage for large vessels is at Porto Conte, about 9 miles to the N.W. The population in 1882 was 9000. During the Spanish occupation the town was a favourite residence of Charles V.

ALGIERS (French, *Alger*; Arabic, *Al-Jazair*, "the Island"), the capital of Algeria, is situated on the west coast of a bay of the same name in the Mediterranean. It was first built about 935 A.D. by Jussuf Zeil, an Arabian chief of the Zeirite dynasty, which succeeded that of Aghlab in the sovereignty of the country. It is in the shape of an irregular triangle, of which one side is formed by the sea-coast, and the other two run up the acclivity of a steep hill which faces the N. and N.E., and which is crowned by the Casbah, or ancient fortress of the city. The houses rise gradually one above the other, so that there is scarcely one that has not a view of the sea from its terrace. The native houses are square, and mostly two stories high; they have a closed court in the middle, on which, and not on the street, the windows of the

apartments open. The flat terrace at the top is the resort of the family, especially in the evening, to enjoy the sea breeze. The buildings are of white stone, and though rather dazzling in such a bright climate, present a striking and picturesque appearance from a distance. The circumference of Algiers was formerly little more than 2 miles; in the old town the streets are very narrow, the widest being only 12 feet. Since its occupation by the French, a new town has been constructed near the sea-shore, in the centre of which is a large handsome square, with a fountain and orange and lime trees. The government offices, barracks, hotels, and other buildings give this part of Algiers quite the appearance of an European town. One of the most notable improvements is a splendid new terrace, raised upon a series of lofty arches along the sea front of the city. The hills, which rise in the form of an amphitheatre around the city, are studded with country-houses, gardens, vineyards, and olive groves. Algiers is well supplied with water, which is conveyed from the country by an aqueduct, and then distributed by conduits all over the city. It has become one of the health stations for wealthy Europeans, who visit it to escape the rigour of their own winter. Fogs and white frosts are unknown, and the winter temperature is uniformly mild and genial. Algiers, besides being the residence of the governor of Algeria, and of the prefect of the department of Algiers, is also the seat of a bishop. It possesses also a royal college, schools, library, courts of law, bank, and opera-house, as well as various mosques, Roman Catholic and Protestant churches, and Jewish synagogues. The town is well fortified towards the sea, but is commanded by neighbouring hills. It has two fine suburbs, and horse-racing forms a favourite amusement. The harbour has been improved, and its two docks will accommodate the largest ships. The trade is considerable, and will be found referred to under ALGERIA. Algiers has regular steam communication with French and other ports, and is also connected with France by a submarine cable. The population in 1882 was 35,000 Europeans and 20,000 natives.

ALGO'A BAY is an inlet on the south-east coast of Africa, about 20 miles wide from east to west, and nearly 500 miles east of Cape Town. The anchorage is good, and for six months of the year, when the north-west winds prevail, is perfectly secure, but during the remaining months a heavy sea rolls in from the south-east. The tide rises in the bay from 6 to 7 feet. It has a level sandy shore, and receives several rivers, the chief of which are the Sunday and Bausher. At the mouth of the latter is Port Elizabeth, distant about 5 miles N.W. from Cape Recife, the western point of the bay. It was in this bay that the first body of British emigrants to the eastern province of Cape Colony landed in 1820. It forms the chief harbour, and has an increasing trade.

AL'GUAZIL, an officer in Spain answering to the English bailiff. The name is from the Arabic *el-razil*, or from the Hebrew verb *gazel*, which means "to catch." The duty of an alguazil or alguacil is at present confined to the apprehension of criminals; the office of executioner, which he also formerly filled, being now discharged by the *verdugo*.

ALHA'MA, a town of Spain, 26 miles S.W. of Granada, in the province of the same name. It has a very picturesque situation on the edge of a chasm, through which flows the river Marchan. Near it are hot mineral baths, and these, together with the Moorish and other antiquities which are to be found here, cause the place to be much frequented. Its population is 7000. There is another Alhama 19 miles W.S.W. of Murcia, in the province of Murcia, which also has mineral waters, and a population of 6500. The name is said to be Arabic, and to mean "warm baths." It is applied to several other small places in Spain.

ALHAMBRA, properly Alambra, a small town of Spain, in the province of La Mancha, 40 miles E. of Ciudad Real. It contains many inscriptions and other Roman antiquities, and there can be little doubt that it marks the site of the town called *Laminium* in the "Itinerary" of Antoninus.

ALHAMBRA, an ancient castle and palace of the Mohammedan kings of Granada. It was begun by Ibnul-ahmar in 1211, continued by his son Abu'abdillah, and finished by his grandson, Mohammed III., about 1341. It occupies the site of the *Kassaban al-hamra*, the "red inclosure," and was originally called the *Kal'at al-hamra*, the "red palace," of which the present name is a corruption.

The Alhambra is situated on a hill to the east of the town of Granada. It is surrounded by a strong wall, flanked by square towers, and inclosing an area of 2500 feet in length, and 650 in breadth. The walls follow all the windings of the mountain, and are constructed of "tapia," an artificial concrete, consisting of pebbles, rubble, and lime, put moist into a wooden frame. When the mortar was set the frame was removed, and the portions were used successively in building the walls, which grew harder by time. The colour is reddish, and hence the name *al-hamra*, "the red." The river Darro flows by the base of the hill on the east, north, and west.

The exterior appearance of the Alhambra is simple and severe, and gives no indication of the gorgeous beauty



Gate of Justice.

which once distinguished the interior. Having ascended the hill from the city of Granada, a natural terrace is reached in front of the *Torre de Justicia* (the Gate of Justice), which is the grand entrance. A fine tank in front of this gate is now filled up with rubbish. The *Torre de Justicia*, so called because justice was dispensed there after the manner of the East, is a square tower with a double entrance gate, the horse-shoe arch in front rising to half the height of the tower. An inscription on a stone in this tower mentions the date when it was completed, A.H. 713 (A.D. 1313). Having passed through the double entrance-gates, a narrow passage conducts to the *Plaza de los Aljibes*, or "Court of the Cisterns," which are two, the largest, 102 feet long and 56 wide, arched over, and inclosed by a wall 6 feet thick. In these cisterns the water from the river Darro deposited its sediment, and was kept cool for the use of the castle.

On the east side of this Plaza is the *Alcazaba*, which is a palace built for Charles V. in the Cinquecento style, by the architect Alonso Berreguete. On the north is a very simple and unostentatious entrance to the Mesnar, or com-

mon bathing-court, 150 feet in length and 56 in width. It is paved with white marble, and the walls covered with arabesques of admirable workmanship. In the midst of this court is a basin sufficiently large to swim in, bordered with parterres of flowers, beds of roses, and rows of orange trees. This court was designed as a common bath for servants and other dependents of the palace, and supplied with water the fountains of the other departments.

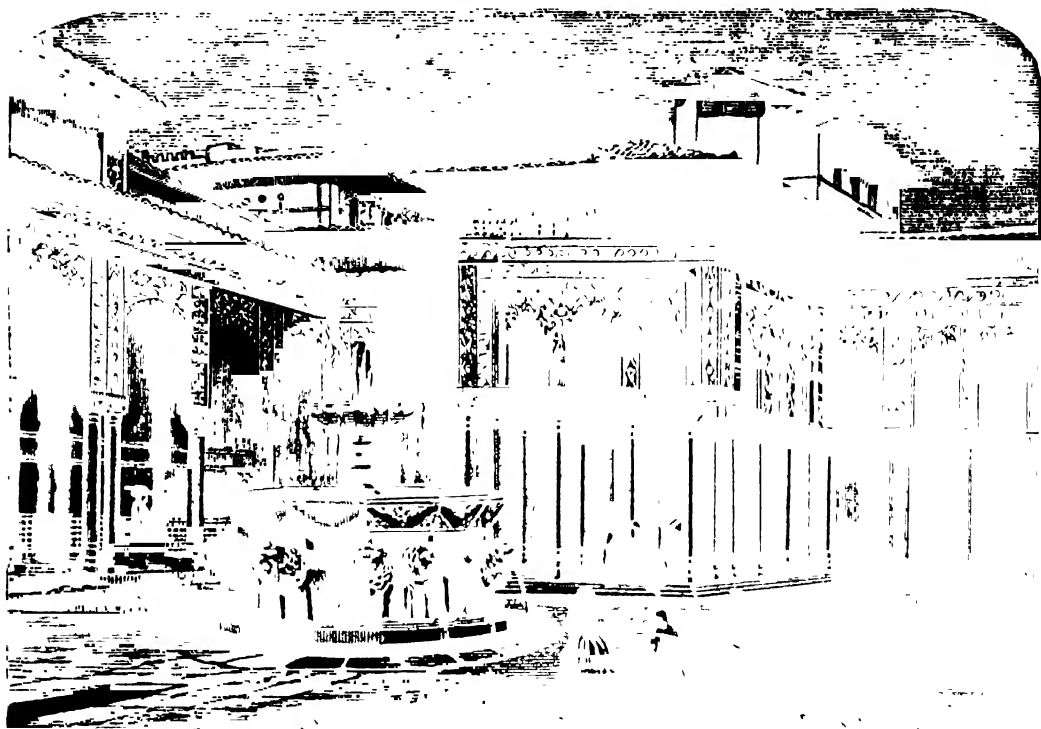
At the lower end of the Mesnar is an archway leading to the *Patio de los Leones*, or "Court of Lions." It is open to the sky, measures 100 feet by 60, and is paved with white marble. In the centre of it is a large basin of alabaster, of twelve sides, resting on the backs of twelve lions, rudely carved. Over this basin a smaller one rises, from which a large body of water spouts into the air, and falling from one basin into the other, is sent forth through the mouths of the lions. This court is surrounded by a gallery supported by above 100 slender and elegant columns, 9 feet high, and 8½ inches in diameter. These columns are very irregularly placed; sometimes they are single, and sometimes in groups of two or three. The walls, up to the height of 15 feet from the ground, are covered with blue and yellow mosaic tilings. The columns and ceiling of the gallery are beautifully ornamented with arabesques and fret-work in the most exquisite taste. Around the upper face of the Fountain of the Lions are some Arabic verses, which describe, in a style of Oriental hyperbole, the wonders and the beauty of the fountain. From each end of the court projects a portico, which is also supported by slender marble columns. On the left side of the Court of the Lions is the *Sala de los Abencerrages*—so called from the legend of the massacre of certain illustrious chiefs of that name—and opposite to it is the *Sala de las dos Hermanas*, or "Hall of the Two Sisters," so called from two huge flags of white marble, without a flaw or stain, which are in the pavement. On the upper end of the Mesnar stands the magnificent Tower of Comares. This massive tower rises above the rest of the building, and overhangs a deep ravine, which descends almost perpendicularly to the river Darro. The prospect from this tower is truly magnificent. The delightful valley through which the Darro flows, part of the city of Granada, and the beautiful plain in which it stands, present an enchanting natural panorama. The Hall of the Ambassadors, which occupies the whole of the interior of the Tower of Comares, still preserves traces of its past splendour. The walls are richly stuccoed and ornamented with arabesques of exquisite workmanship. The ceiling is of cedar-wood, inlaid with ivory, silver, and mother-of-pearl. The three sides of the hall are full of windows, formed in the immense thickness of the wall, which thus allow a free circulation to the air, and admit a faint light, which produces a surprising effect. In the same manner all the halls of the Alhambra are lighted and ventilated. To the east of the *Sala de Comares* is the *Teador de la Reina*, or Queen's Dressing-room, and near it is the Garden of Lindaraja, with its alabaster fountain, and groves of roses, myrtles, and orange trees. Modern research has brought to light another hall, called the Hall of the Escutcheons.

At a short distance from the Alhambra rises the *Cerro del Sol*, or "Sun Mountain," on which the Generalife is situated—a palatial villa where the Mohammedan kings spent the summer months. It is built in the same style as the Alhambra. Its situation is highly picturesque. Here are fountains spouting above the loftiest trees, numerous cascades, terraces placed in amphitheatre, and the immense cypresses which once overshadowed the kings and queens of Granada.

When we examine the halls of the Alhambra, we are no less surprised at the elegance of their construction and

the beauty of their ornaments than at the durability of a work of such a delicate nature; the blue, the carmine, and the gold still preserve all their brilliancy and freshness; the slender columns and apparently fragile filigree work have stood the vicissitudes of five centuries. Much damage was done to the Alhambra by General Sebastiani

in 1810, which has since been partially repaired, and in 1870 the Spanish government granted 60,000 dollars towards restoring and preserving the building. The Court of Lions, Tribunal of Justice, and Hall of the Abencerrages are reproduced in a most elaborate and splendid manner at the Crystal Palace, Sydenham.



Court of Lions.

The Alhambra is guarded by a body of *invalidos*, or retired veterans, who serve as guides.

ALIAS, in legal proceedings, denotes a second or further description of a person who has gone by two or more different names. For example, if the same person is known by the name of John Smith as well as the name of John Thompson, he is described in civil and criminal pleadings, and in legal language generally, as John Smith, *alias dñctus* (otherwise called) John Thompson.

ALI BEN ABI TALEB, surnamed by the Arabs *Abul A'lah*, and by the Persians *Shir-i-Khoda*, i.e. the Lion of God, was the fourth caliph or successor of the Arabian prophet Mohammed in the government of the new empire founded by him, and occupied the throne during the years 35-40 after the Hegira (A.D. 655-660). He was the cousin-german of Mohammed, and had from his childhood lived under his care and protection. When the latter announced himself as a prophet, Ali, then ten or eleven years old, was, according to tradition, the first man who acknowledged his divine mission. From these circumstances, and also on account of his marriage with Fatima, the daughter of Mohammed, Ali appeared to have strong claims to the commandship over the Faithful, when the Prophet died (A.D. 632) without leaving male issue. Three other associates of the Prophet, Abu Bakr, Omar, and 'Othman, were, however, successively appointed caliphs before Ali came to the throne (A.D. 655). After a reign of only five years, occupied entirely with civil and foreign

Wars, he was assassinated with a poisoned sword in his residence at Kufa, and died three days after (A.D. 660), at the age of about sixty.

Ali had three sons by Fatima—Hassan, Hussein, and Mohsen; the latter died very young. Hassan succeeded his father for a short time in the government, and with his murder terminated, according to Arabic historians, the *legitimate* caliphate, i.e. the succession of those caliphs who had been appointed by the free choice of the Faithful. The Persians and some Tartars are Shiites (Schismatics), and they consider Ali the true successor of Mohammed, the others being interlopers. Amongst them, therefore, the tragedy of Hassan and Hussein is held sacred, and forms the subject of a miracle play, lasting several days. See SHIITES, HASSAN.

ALIBI, a Latin term which signifies "in another place." If a person charged with an offence committed at a certain time and place shows that he was elsewhere at that time, he is said to prove an *alibi*. If true, this is obviously the best proof of innocence; but no kind of defence offers so ready an opportunity for false evidence.

ALICANTE, a maritime province of Spain, bounded on the N. by Valencia, S. and W. by Murcia, and E. by the Mediterranean, with a length of about 70 miles, a breadth of 60 miles, and an area of 2100 square miles. Except on the sea-coast the territory is mountainous, but notwithstanding a slight rainfall extremely fertile, and produces rice, sugar-cane, esparto grass, and many tropical

vegetables and fruits. Much care is bestowed on the rearing of silk-worms and bees, and the wine produced is some of the best in Spain. Amongst minerals copper and lead may be mentioned. Manufactures are not neglected by the inhabitants, who are extremely industrious. They consist of silk, cotton, and other fabrics, paper, earthenware, leather, &c. Fishing is prosecuted. Barilla is obtained from sea-weed, and salt from the marshes on the sea-coast. These districts, however, are not very salubrious. There are no rivers of any size. Population, 408,000. Alicante formed part of the ancient provinces of Alicante and Murcia.

ALICANTE, a well-built seaport, situated on a bay of the Mediterranean, in the above province. The town is built on a peninsula, at the foot of a hill, which has a fortified castle on its summit.

Alicante is the terminus of the South-eastern Railway from Madrid, and its prosperity has much augmented since the opening of the line in 1858. It is now the third seaport in Spain. The chief buildings are the cathedral, bishop's palace, town-house, museum, and library. There are also a school of navigation and several benevolent institutions. Cotton, woollen, and linen goods and soda are manufactured, and there is also an extensive cigar manufactory, which is a government monopoly. It employs upwards of 4000 women, has a very wide reputation for superior finish, and is constantly at work.

The foreign trade of Alicante consists chiefly of imports of coal, iron, machinery, cod-fish, and guano. The exports are raisins, oranges, and asparto to Great Britain; wine to France; and liquorice root to the United States. The wine, called from its dark colour *vino tinto*, is chiefly shipped to the port of Cette, in Languedoc, whence it is sent to Bordeaux, to be mixed with the inferior Medoc clarets. Oil, olives, almonds, and soap are likewise exported. The port of Alicante is an open bay, 10 miles in width, between the Cape de la Huerta and Plana Island, from which latter place very fine marble is procured. The anchorage is good, but only small vessels can approach the mole or quay to take in or discharge their lading. English and other consuls are stationed here.

Alicante stands on the site of the ancient town of *Lucentum*. It was besieged by the Moors in 1331, and again in 1709 by the French, when a British officer who had charge of the fortress perished in an explosion. During the Peninsular war in 1812, when the French general, Suchet, succeeded in making himself master of the rest of the kingdom of Valencia, Alicante had the honour of successfully resisting the invaders. It was also bombarded by the Intransigent insurgents in 1873, but the guns of the fort were more than a match for those of the ironclads, which were disabled after two days' fighting. The population in 1882 was 32,000.

ALICATA or **LICATA**, surnamed *L'Amata*, "the beloved," the most important commercial city on the south coast of Sicily, in the province of Girgenti. Population, 17,500. The town is built on the right bank of the Salso, the largest river of the island, and although it possesses no harbour it exports considerable quantities of grain, macaroni, pistachios, almonds, sulphur, wine, and soda. The ancient *Phintias* is believed to have occupied this spot, and near here many of the most remarkable events of the Punic wars were enacted.

ALIEN. An alien is one who is born out of the ligeance (allegiance) of the king (Littleton, 198). The word is derived from the Latin *alienus*, but that used by the English or other law writers in Latin is *alienigena*. The condition of an alien, according to this definition, is not determined by place, but by allegiance. [See ALLEGIANCE.] The word alien has of late years been little used—"foreigner" being more generally preferred, as having a

sound less harsh. It is, however, still employed in all official and legal documents.

The regulations which have been made for the treatment of aliens in this country have varied at different periods. The first order on the subject was one of Henry III., which declared that merchant strangers should have leave to come and go, and to trade on the same footing as English merchants; "and if they be of a land at war against us, and if such be found in our land at the beginning of the war, they shall be attached without harm of body or goods until it be known unto us or our chief-justice how the merchants of our land be entreated." Edward I. gave to aliens a remedy against the hands of their debtors; and Edward II., as might have been expected in a prince so much given to the company of foreigners, granted them other privileges, which had rather the effect of rousing jealousy in the minds of the English than of satisfying the foreigners, who still craved for more.

Edward III. and Richard II. passed many statutes which aimed at encouraging aliens to engage in English commerce. By a law of the former king an act of justice was done to aliens, who seem before that time to have been answerable for the faults of their fellows, though they might have been powerless to control or to avert them in any way. A most important order, considering the frequency of war, was also made to the effect, that after proclamation of war against a state, the people belonging thereto and resident in England should have six weeks in which to sell their goods and get out of the country.

The Parliament of Richard II., which agreed that alien merchants should be well treated in order that they might have the "greater courage to repair" to England, also passed a law to compel them to spend half the money they received for their goods on English commodities, a law which it is needless to say was constantly evaded. The disgust inspired by Richard's proclivities for strangers produced the oppressive regulation of Henry IV., by which alien merchants were compelled to sell their wares within three months, to spend the money they earned upon the commodities of the kingdom, and to dwell only with appointed hosts, who were to be answerable for them both in their personal and commercial conduct. There may have been necessity in the circumstances which attended the anti-French policy of Henry V., for the statute made in his reign, by which the above orders of Henry IV., which were rescinded the year after they were made, were confirmed, with this addition, that hosts were ordered to be appointed at all ports or towns in which aliens dwelt. These regulations, coupled with the natural tendency of men of the same nation to congregate in a strange country, led to the institution of foreign guilds, and to the settlement of foreigners in particular localities of towns. These foreign guilds had charters and grants of incorporation, by which—generally in return for a sum of money—the king granted them certain privileges and immunities. A differential duty in favour of the English consumer was charged on coals, and on certain English manufactured goods sold to foreigners, and various other minor disadvantages were imposed on the aliens; but in the eighth year of Henry VI. a just concession was made to them, which remained in force till 1870, when it was considered no longer necessary. It was found that in the criminal courts an alien, simply because he was such, often had scant justice at the hands of a jury of which the members had a national antipathy to him, even if they were not interested particularly in his fall. An Act of Henry VI. provided that in all cases where an alien was on his defence, he might elect to be tried by a mixed jury, half English, half aliens, at whose hands it was supposed he might expect a righteous verdict.

Richard III., hoping to conciliate the English trades-

men, passed an Act forbidding aliens to be handicraftsmen in England, to make any cloth within the realm, to retail their goods, or to have English servants; and this Act, though ostensibly repealed by Henry VII., was expressly confirmed by Henry VIII., who also made restrictions as to the number of apprentices and journeymen that might be taken. In the twenty-first year of his reign he ratified a decree of the Star Chamber forbidding aliens to keep more than two alien servants, requiring them to swear the oath of allegiance to the king, and forbidding them to set up new shops, or to assemble anywhere but in their common hall. Subsequently he forbade alien handicraftsmen, who were not denizens, to receive a lease of land or premises; and this prohibition continued in force till the present reign, when it was permitted to friendly foreigners to have a lease for a period not exceeding twenty-one years.

In the reign of Charles II. aliens were invited to settle in this country, and to engage in certain trades, by an offer of the privileges of native subjects (15 Charles II. c. 15). This statute was repealed by 12 and 13 Will. III. c. 2; but an Act of Anne naturalized all foreigners who should serve for two years on board any ship of her Majesty's navy or a British merchant ship.

In the early part of the last century (1708) a bill was brought into parliament for the general naturalization of all foreign Protestants, upon their taking certain oaths and receiving the sacrament in any Protestant church, and it passed notwithstanding the strenuous opposition of the city of London, who represented that they would sustain loss by being obliged to remit certain dues which aliens were obliged to pay. After remaining in operation for three years it was repealed on a suggestion of its injurious effects upon the interests of natural-born subjects; but a previous bill for effecting this object was rejected by the Lords. The reasons for and against the measure are stated in the fourth volume of Chambliss's "Commons' Debates," p. 119-122. In 1748 and 1751 a measure similar to the Act of 1708 was brought forward, and in 1751 it was not a second time, but was dropped in consequence of the death of the Prince of Wales, which disarranged the public business.

The Alien Acts (33 Geo. III. c. 1; 34 Geo. III. c. 43, 67, and others) were passed entirely from political motives, and were mainly enacted on account of the great number of foreigners who came to England in 1792 and 1793. The crown had probably always the power of banishing aliens from the realm, which these Acts expressly gave to it; at all events the power has undoubtedly been often exerted, though not of late years without the sanction of Parliament. In 1827 a measure was introduced (7 Geo. IV. c. 54) for the general registration of all aliens who came to this country. This Act was repealed by 6 Will. IV. c. 11, but new provisions of a similar character were introduced. They however, gradually, fell into disuse.

By the 7 and 8 Vict. c. 66, it was enacted that any person born out of Her Majesty's dominions of a mother being a natural-born subject, should be considered a natural-born subject. Any woman married to a natural-born subject or a person naturalized, was to have all the rights of a natural-born subject; and the child of an Englishman and an alien could take any property, real or personal, by inheritance, in the same way as if his father had been an Englishman. In fact, the only distinctions of the former practice recognized in recent years between aliens and natural-born subjects were—that the former could not vote for a member of Parliament or be themselves elected, could not sit on juries, and could not hold land for more than twenty-one years. The latter disability was, how very long got over in practice by the

ingenuity of lawyers, and was entirely removed in 1870. They can now hold every kind of real and personal property except British vessels—it being considered that a person who owes no allegiance to the state, and who, when on the sea, is no longer amenable to our laws, should have no claim on the protection of the British flag, and more especially so as a ship, unlike real estate, may at any moment be withdrawn from British dominion altogether. With this exception, and the fact that the property held by an alien does not qualify for any office or municipal, parliamentary, or other franchise—it being considered only reasonable that if such persons have not sufficient interest in the country to become naturalized they should not enjoy these privileges—aliens are now admitted to all the rights of British subjects.

According to the old doctrine, a man born in England but migrating to another country not only still remained an Englishman, but any children born to him in that country were also English subjects, although their mother might have been an alien. The object of this early law was undoubtedly to confer on the foreign-born children of an Englishman the privileges of English subjects; but a later Act, passed in the reign of Queen Anne, was construed by the judges not only to give them the privileges but to render them liable to the duties of British citizens. This latter statute, followed by another Act of George II., made in theory the issue of an English father English for two generations. This doctrine was, of course, quite incompatible with the facility of modern travel, and it was no sooner challenged than it fell to pieces. For instance, under it hundreds of thousands, if not millions, of persons permanently settled in the United States had legal claims on the British government which it was notoriously impossible to accede to; and on the other hand the government had legal rights over them which it was also notoriously impossible to enforce. This was especially exemplified at the commencement of the American civil war in 1861, when many persons—to all intents and purposes citizens of America—claimed exemption from conscription on the ground of their being British subjects—a claim which both the English and American governments refused to recognize. To put an end to such an unsatisfactory state of affairs a commission was appointed to consider the whole subject in 1868; and the result of their deliberations was the passing of an Act, in 1870, under which any Englishman who chooses to do so can renounce allegiance to his own country by becoming naturalized in another, thus avoiding the anomaly of the double nationality which formerly existed. A convention, arranged in 1871, defined how he may, if so disposed, repatriate himself at a subsequent time, the process simply consisting of a declaration made, in the case of an American, before a United States Consul; or, by an Englishman, before a justice of the peace. The old method of trial by a jury *de medietate lingue* was also abolished by the same Act, it being considered that the circumstances under which it originated had become obsolete, and that it was an unjustifiable stigma on the English nation to assume that an alien on his trial would not be treated fairly by British subjects alone. Formerly an Englishwoman marrying an alien remained an Englishwoman, and did not lose her nationality; but there were great inconveniences in the wife being a citizen of our country and the husband of another. The domicile of the wife, the law by which her property and relations with her husband and family were regulated, was the same as that of her husband, and so with the children of any person domiciled in a foreign country; but with nationality it was different. Under the new law, however, the wife acquires the nationality of her husband. The children of Englishmen who are minors at the time of their father's naturalization in a foreign

country, if they reside with him in the country of his adoption, become also subjects of that country, but not otherwise. The reason for this difference is obvious. Children may have embarked in pursuits in England which they prefer to any career open to them in the country of their father's adoption; they may, though under age, be in the English army or navy, and we should not think of converting them into Frenchmen, Germans, or Americans because their fathers had chosen to settle and be naturalized in those countries. They have, however, the option of claiming their naturalization as a right when they become of age. The United States have conformed as far as possible to the spirit of the new English law, and now claim no allegiance from Americans properly naturalized in this country; but several states both in Europe and America still retain the old idea of an indelible allegiance, and will not admit, in theory at least, that their subjects can legally renounce their nationality. Of course no notice is taken of this objection if a person belonging to one of those countries, but resident in the United Kingdom, desires to become naturalized here, and complies with the proper regulations, the chief being a three years' residence [see NATURALIZATION]; but as serious complication might arise if such persons returned to their own country and claimed protection as British subjects, whilst acting perhaps contrary to their original allegiance, it has been provided that naturalization shall confer the privilege of a British subject, and shall entitle persons to protection as such in every country except that to which the man originally belonged; and if he chooses to return and place himself in its power, or subject himself to any procedure which that country may adopt with reference to any act of his, it must be at his own risk. It is not reasonable or right that when we have conferred the privilege of naturalization for the purpose of allowing such persons to engage in pursuits most suitable to them, they should expect us to protect them against the consequences of their own acts when they return to the country of which they were originally subjects.

Perhaps the greatest anomaly still existing as regards aliens is that the child of alien parents, if born in this country, is a British subject, except in the case of ambassadors and other official residents, whose children have always been recognized as belonging to the country their fathers represent, or in whose service they are. The same law also prevails in the United States; but in almost every other country in Europe and America the nationality of the child depends on its parents, and not on the accidental locality of its birth. A person without any will of his own in the matter may therefore be liable to a double nationality, and formerly he was not even able to divest himself of it if he wished to do so; but under the new Act he may renounce his English allegiance, if he wishes to do so, when he comes of age.

The laws of other countries as to aliens and nationality vary very much. As before stated, that of the United States of America is very similar to our own. Under a statute of 1855, the privilege of citizenship was conferred on persons born of American parents out of the territories of the States, but it is limited to one generation, unless the parents have resided in the States—there being an express provision "that the rights of citizenship shall not descend to such persons whose fathers never resided in the United States." Any woman married to a citizen of the States is now deemed and taken to be a citizen.

The nations of Continental Europe make nationality depend, some exclusively and all principally, on the nationality of the parent; and under the law of no country is the child of a subject other than a subject by reason of having been born out of the dominions of the particular country. Such, however, was not the ancient law of Con-

tinental nations universally. On the contrary, in some at least, if not all, birth within the dominions of the particular country, as well as parentage, determined the nationality of the individual.

In France the framers of the "Code Napoleon" excluded the place of birth as the source of nationality in itself, but they allowed it to have effect so far as to give the offspring of an alien the right of claiming French nationality on attaining full age. The example set by the framers of the French code has been followed with slight modifications by the nations by which that code has been adopted, and also by others, in remodelling their constitution or codes, and it now prevails in Belgium, Spain, Italy, Greece, and Baden.

In Austria and Prussia the law is that the children of Austrians and Prussians are legal subjects wherever born, but in neither state does birth within the country confer any right on an alien. The law is the same in Bavaria, Saxony, Wurtemberg, and the minor German states (except Baden), Switzerland, Sweden, and Norway. Denmark, Portugal, and Holland are the only continental states in which the circumstance of having been born in the country gives to the child of an alien the character and status of a subject without the necessity of claiming it; but in Portugal he can be emancipated if, when of age, he declares that he does not wish to be a Portuguese; and in Holland he must, when of age, declare his intention of remaining in the country and establish his domicile there.

The Russian Law is liberal to aliens, and confers nationality on the children of alien parents, not only if born and educated in the Russian territory, but also on those born out of it, if they have completed their education at a Russian upper or middle school. In both cases the desire to become a Russian subject must be declared within a year after attaining majority.

In the South American states the old Spanish law formerly prevailed, according to which birth within the territory was necessary to citizenship. Since their independence various alterations have been made. By the constitution of Columbia, the offspring of Columbian parents born abroad acquire the character of citizens on being domiciled within the country. In Venezuela all persons born in the country are Venezuelans, whatever may be the nationality of their parents, or who, being the children of a Venezuelan father or mother, fix their residence in the country and express their desire to be considered as such. In Bolivia the children of all Bolivians, wherever born, are considered subjects; and the right is conferred on persons born of alien fathers within the republic, who have resided in the country and declare their intention of fixing their domicile in it. The Argentine Republic has given to the children of aliens born within the territory the option of taking the Argentine citizenship, or of adhering to that of their fathers. In Brazil all persons are subjects who are born in the country, although their father be a foreigner, if not resident in the service of his nation; and the children of Brazilian parents, though born in a foreign country, if they become domiciled in Brazil.

In every country the nationality of woman on marriage merges in that of her husband, except as regards America, which still retains the old English law in this respect—so that an American woman married to a foreigner retains her nationality.

Having treated very fully both of the former and present position of aliens in this country in a previous part of this article, it may here be as well to state briefly their position in other countries, taking chiefly for our guide, as we have previously done in describing what constitutes an alien elsewhere than in England, the very admirable work on "Nationality" by the late Lord Chief Justice Cockburn, published in 1869.

In France, where the law as regards aliens was formerly exceedingly severe, they are now treated with great liberality; and since 1819, as regards the acquisition and disposal of property of every description, the foreigner has stood in all respects on the same footing as the Frenchman. The few incapacities under which foreigners now labour in France are almost entirely of a political character. Thus they are excluded from all public functions, and cannot, of course, hold any office for which an oath of allegiance to the sovereign is required, for which reason they cannot be advocates, notaries, or avoués. Neither can they exercise the profession of physician or surgeon, or the business of chemists, without special authorization. Foreigners domiciled in France with the authorization of the head of the state, enjoy all civil rights so long as they reside in France—differing, in fact, from a Frenchman only in this, that the latter of course carries his nationality with him wherever he may go.

France was the first country to break through the ancient prejudices in respect to foreigners, and her liberal example has been followed by many other nations, especially those in which the "Code Napoleon" has been adopted; although in some instances the progress towards a more enlightened policy has been very gradual. The law of Belgium is now exactly the same as that of France, although up to 1865 foreigners were not entitled to hold landed property in that country. It may be remarked, however, that the right of summarily expelling aliens is claimed by France in a far more arbitrary and absolute degree than by any other country. Numerous instances of extremely summary expulsion, and even imprisonment, of aliens occurred under the first Napoleon; and on the outbreak of the recent war with Germany the treatment of Germans residing in France was such that the victors added a considerable sum to the indemnity they exacted, in order to compensate their fellow-countrymen. The Portuguese code confers on all foreigners the same rights, and subjects them to the same civil duties as the Portuguese, except in cases in which either a express law or special treaty shall provide otherwise. In the code of the new kingdom of Italy, in one short sentence, "the foreigner is admitted to all the civil rights of the citizen," unaccompanied by restriction, condition, or qualification. In Austria they enjoy all civil rights, except those which relate to public offices and the exercise of some professions and trades. In Prussia, as in Austria, aliens may acquire both real and personal property, and they enjoy all the rights of Prussian subjects in the carrying on of business duly authorized, whenever the respective foreign state has not to the disadvantage of aliens generally, or of the Prussian state in particular, imposed burdensome regulations, in which case retaliation may occur. In Denmark foreigners are in precisely the same position as native subjects as regards private rights. In Holland the legislation as regards aliens has been less satisfactory, their rights being based on the uncertain criterion of reciprocity. Foreigners are, indeed, assimilated to native subjects generally, and the law is favourable to them with regard to admissibility to public offices, there being a large number of offices in which they can be employed. In Russia the former restrictions as regards foreigners have been abolished, and their rights considerably extended since 1860. They can now hold landed property as well as personal, and are allowed to trade, and to be naturalized. They may also hold commissions in the Russian army, and take the several ranks in it. They cannot, however, hold the office of judge, magistrate, justice of the peace, and cannot be advocates or solicitors pro. Neither are they allowed to enter the civil service, but an exception is here made in the case of professional and scientific men. The law of Sweden to aliens is based on the principle of reciprocity. In Norway

they are in substance placed on the same footing as Norwegians.

In America, so far as the law concerning the rights of aliens is within the authority of the federal legislature, the modern liberal view of the subject has prevailed. For instance, by recent Acts of Congress, public lands may be purchased by aliens, and aliens can also take out patents for inventions on the same terms as native citizens. But no vessel is entitled to be registered as a vessel of the United States, or to have any privilege as such, unless wholly owned by citizens of the States, and commanded by a citizen. The right of aliens to hold lands, other than public land belonging to the Union, depending on the law of the state in which such land is situate, some variety of legislation naturally exists. In several states the old law as to the disability of aliens to hold landed property has been abrogated; in others, aliens may acquire lands, but *bona fide* residence is necessary; whilst in others the right is only conceded to resident aliens who have declared their intention to become citizens of the United States, as required for the purpose of being naturalized.

In India and nearly all the British colonies the liberal views of the proper treatment of aliens which have been adopted in England and Europe generally, have already been, or are gradually being, carried into effect. The law as to naturalization, both in the United Kingdom and other civilized countries, is described at length in the article NATURALIZATION.

ALIGARH, a district of British India in the north-western provinces, in the division of Meerut, lying between 27° and 28° N. lat. and 77° and 78° E. lon. The area is 1961 square miles, and the population in 1881 was 1,100,000. Its boundaries are—on the north the river Ganges and the Bulandshahr district; south, the Muttra and Agra districts; east, the district of Etah; and on the west the river Jumna and the Muttra district. The surface of the country forms a broad level plain, and is part of the territory known as the Doab, of the climate of which it partakes. In the higher parts of the country large barren tracts occur, caused by the presence of a noxious kind of salt which lies in a white crust on the ground. Besides the Ganges and the Jumna, between which Aligarh lies, the only other river of importance is the Kali Nadi, which intersects the entire district. The magnificent Ganges Canal, running from north to south, divides at Akrahad, and terminates in two branches at Cawnpore and Etawah respectively; it is of great service in irrigation. The chief products are cotton and indigo (the cultivation of which has largely increased of late years), wheat, barley, jowar, and bajra; there are no manufactures. In addition to the above articles the exports embrace oil-seeds and saltpetre; the imports are rice, sugar, tobacco, and manufactured goods generally. Communication by road, water, and railway is excellent. The chief centres of commerce are Hathras and Koil.

ALIGARH FORT, with the large adjoining native town of Koil, is the civil station and administrative headquarters of the above district. Its distance from Delhi is 84 miles south-east, and from Calcutta 808 north-west. The East Indian Railway has a station here, and there is also a junction with the Oudh and Rohilkhand line. The public institutions, besides the courts, district jail, schools, and church, embrace a remarkable native association, the Aligarh Institute and Scientific Society, founded in 1864 by Sayyid Ahmad Khan, C.S.I. Its object is to introduce into the native languages modern works of science and history. It publishes a journal, and has a library of 2000 volumes and a reading-room. The population, including Koil, in 1881, was 60,000. The fort was taken in 1803 by Lord Lake from the Mahrattas, who were offered by the French general Perron. The native troops joined in the

rising of 1857, but the Europeans succeeded in escaping with their lives.

ALIMENTARY CANAL is the tube passing through the body. It consists of various portions, which have received separate names in view of their varying functions—(ESOPHAGUS, STOMACH, INTESTINES. For Plates, see **PHYSIOLOGY**).

ALIMONY (from the Latin *alimonia* or *alimonia*, a word which is used by the classical writers, and signifies "maintenance or support"). If a wife is separated from her husband by a sentence of the Court of Divorce, she generally obtains by the sentence an allowance out of her husband's estate, which is called alimony. But if she has a separate and sufficient income beyond the husband's control, the wife is not entitled to alimony. In the Court of Divorce the decree for alimony is incidental to a decree of divorce or judicial separation upon the ground of cruelty or adultery on the part of the husband.

The amount of alimony depends wholly upon the judgment of the court, which is exercised according to the circumstances of each particular case. The station in life of both parties, and the fortune brought by the wife, are considered; and much stress is laid upon the disposal of the children and the expense of educating them. If the wife has eloped from her husband, or where the sentence of divorce proceeds upon the ground of her adultery, the court will not allow alimony. Alimony will be granted during the continuance of a suit, but it is always much less in amount than permanent alimony.

The assignment of alimony during a suit will not discharge the husband from liability for his wife's contracts; but when the court has allotted her a permanent maintenance upon the termination of a suit, the wife is liable for her own contracts, and the husband is wholly discharged from them.

The equivalent in Scottish law to the term alimony is *aliment* or *alimentary allowance*. A wife is entitled to aliment from her husband when she is deserted by him, when she is judicially separated from him, and during the continuance of an action of divorce, whether at his or her own instance. She has no right to aliment in the case of a voluntary contract of separation. It is a general principle of the law of Scotland that a person who by disease or otherwise is unable to support himself is entitled to an alimentary allowance from the nearest relation he can prove capable of affording it, but the House of Lords have shown a disposition to restrict the operation of this principle. The father of an illegitimate child is bound to make an alimentary allowance for it until it shall have attained thirteen years of age, but not so if its mother marry meanwhile.

ALI PASHA, a celebrated Albanian chief, was born about 1741 in the little town of Tepelen, at the foot of the Klisourra Mountains. Ali's family belonged to the Albanian tribe or clan of the Toske. One of Ali's ancestors, after being for some time a klepht or highway robber, made himself master of Tepelen, and assumed the title of Bey, holding it as a fief of the Pasha of Berat.

The early life of Ali (who owed his succession, boy as he was, and surrounded by fierce foes, to the unscrupulous energy of his mother) was passed in the usual vicissitudes of a predatory warfare, and sufficiently varied by a succession of adventures possessing the interest of romance, though marked by ferocity and treachery. At length his riches gave him the means of intriguing at the Porte; and he was appointed lieutenant to the new Derwend Pasha of Roumelia, in which office he enriched himself by sharing with the klephts the produce of their spoils. In consequence the roads soon swarmed with robbers; repeated complaints reached the Porte, and the Derwend Pasha was recalled and beheaded. The lieutenant (Ali), who was

also summoned, sent presents to several members of the divan instead of appearing, and thus evaded punishment.

Ali's reputation for bravery and decision was, however, established at Constantinople, and when the war broke out in 1787 between the Porte and Austria and Russia, he was appointed to a command. Having distinguished himself in the field, he was next appointed to the pashalic of Trikala in Thessaly, and was moreover named Derwend Pasha. He now raised a body of 4000 men, all Albanians and old klephts, with whom he soon cleared the roads of robbers, and thus won merit with the Porte. He now turned upon Yanina, the capital of Epirus. Assisted by his friends in the town, he entered it and took possession of the citadel. He then, by bribery, got himself confirmed in the pashalic which he had thus usurped. The Porte, seeing this so long turbulent province reduced by his vigorous despotism to subjection, gladly confirmed Ali in his government.

Ali extended his dominion over all Epirus, and also into Acarnania and Ætolia or western Greece, by successfully attacking the revolted ARMATOLI. He attacked the Suliotes, a people inhabiting a mountainous district about 30 miles S.S.W. of Yanina. After a brave and protracted resistance of more than ten years, the Suliotes agreed to evacuate their country in December, 1803; but on attempting to retreat, in order to embark at Patra, Ali's soldiers fell upon them, and the scenes that followed were dreadful. None of the Suliotes surrendered—almost all perished. A remnant of these unfortunate exiles were subsequently, under the auspices of England, restored to their native country. But Ali was shackled on the sea side of his dominions. He therefore attacked with the greatest ferocity and reduced in succession the fortress towns on the coast of the Adriatic, formerly dependencies of Venice, and then in the hands of the French.

Ali extended his dominions to the north into Albania more by intrigue than by force. The Porte was obliged to wink at these usurpations. Ali was even appointed supreme inspector of Roumelia, and he went to reside at Monastir, at the head of 21,000 men. His extortions in Roumelia were very great. Ali was now vizier or pasha of three tails, and his dominions extended over all Epirus, half of Albania, part of Thessaly, and the whole of western Greece, from the Lake of Ochrida on the north to the Gulf of Lepanto on the south, and from Mount Pindus to the Adriatic.

Ali Pasha, although hated by the Porte, might have ended his days in peace; his power was so great that Napoleon made a separate alliance with him in 1807, and England a year or so later. This made him feared, and his advanced age was an additional inducement to the sultan to wait patiently for his natural death. But an attempt to procure the assassination of one of his confidants, who had abandoned him and obtained an appointment in the seraglio at Constantinople, aroused the ire of the sultan. Ali was excommunicated, and all the pashas of Europe were ordered to march against him. This was at the beginning of 1820, and at length Ali was compelled to abandon Yanina, and to surrender himself on being promised the sultan's pardon. His own perfidy was now retorted on himself. He was murdered; his head was cut off and sent to Constantinople, where it was exhibited before the gate of the seraglio. His sons shared their father's fate. Thus Ali Pasha, at seventy-two years of age, closed his extraordinary career, on 5th February, 1822.

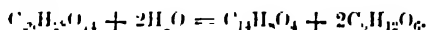
ALiquOT PART. One number or fraction is said to be an aliquot part of a second number or fraction when the first is contained an exact number of times in the second. Thus 6, 3, 1, 2, $1\frac{1}{2}$, $\frac{7}{8}$, $\frac{1}{2}$, &c., are all aliquot parts of 12, being contained in it respectively 2, 4, 3, 6, 8, 28, 96, &c. times. The word is principally used in the arithmetical rule called **PRACTICE**.

ALISMACEÆ is an order of flowering plants belonging to the class of Monocotyledons. This order approaches so near Ranunculaceæ that, were it not for the embryo having only one seed-leaf (cotyledon), it would be difficult to separate Alisma from such a plant as *Ranunculus pinnatifidus*. The sepals and petals are three in number, and each ovary contains one or two seeds. The underground stem (rhizome) of some plants belonging to the genera *Alisma* and *Sagittaria* is eatable, and *Sagittaria sinensis* is cultivated in China. Some Brazilian *sagittarias* are astringent and used in the manufacture of ink. *Alisma plantago* is common in the British Isles, growing in the water along the margins of ponds.

AL'ISON, SIR ARCHIBALD, was born at Kenley, Shropshire, in 1792. He studied at the University of Edinburgh, and took the highest honours in Greek and mathematics. He was called to the Scottish bar in 1811, but before commencing the active exercise of his profession spent several years in study and travel on the Continent, gathering materials for the history on which will rest his reputation. In 1832 his services as a vigorous political partisan were rewarded by Sir Robert Peel with the office of sheriff of Lunckshire. Provided with an ample competence, he was now able to devote himself to writing his "History of Europe during the French Revolution" (ten vols., 1839-42)—a pretentious work not deserving the wide popularity it achieved. A continuation, under the title of "The History of Europe from the Fall of Napoleon to the Ascension of Louis Napoleon," was published in nine vols. in 1859. Sir Archibald was Lord rector of Marischal College, Aberdeen, in 1845; of Glasgow University in 1851; and subsequently received the degree of D.C.L. from the University of Oxford. He died 23rd May, 1867.

ALI'WAL, a village on the left bank of the Sutlej, 9 miles west of Ludhiana, in the Punjab. It is famous as the scene of the great battle of the first war with the Sikhs. The enemy, who had crossed the river to forage, were attacked by Sir Harry Smith, who pierced their troops three successive times with his cavalry, and drove them into the river with great loss. The action occurred 28th January, 1846, and resulted in the submission to the British of all the territory east of the river.

ALIZARIN ($C_{14}H_8O_4$), the colouring matter of madder, the Oriental name of which is *alizari*. Madder is the root of *Rubia tinctorum*, the most permanent of the red dye-stuffs. Alizarin is obtained by exhausting the root with water, and adding lead acetate to the solution to precipitate organic acids and other substances. The filtrate yields, with basic lead acetate, a precipitate of rubinate of lead, which is decomposed by sulphuretted hydrogen. On evaporating the solution, rubinic acid crystallizes in yellow, glistening, silky needles. This acid is decomposed by boiling with dilute acids or alkalis into alizarin and grape sugar, thus—



The same decomposition takes place in the root itself after long keeping, owing to the action of a ferment which it contains. For this reason madder has to be kept for some years before being used for dyeing; in fact, until this process is completed.

Alizarin crystallizes from spirit of wine in yellowish-red prisms, containing three molecules of water. On heating carefully to 100° C. the water escapes, and at a still higher temperature the alizarin sublimes in brilliant red needles, which solve sparingly in water, but freely in alcohol and ether. In ammonia it dissolves with a purple colour, and with potash and soda it yields a solution which, in transmitted light, appears of a deep purple, and in reflected light of a pure blue, affording a fine example of dichroism.

Alizarin forms with many metals insoluble metallic

compounds—a property which is made use of in dyeing and printing.

In 1868 Græbe and Lieberman discovered the relation of alizarin to anthracene ($C_{14}H_{10}$), a solid hydrocarbon contained in coal-tar, and shortly afterwards succeeded in converting anthracene into this valuable colouring matter. This discovery forms an epoch in the history of organic chemistry, alizarin being the first natural dye-stuff which has been artificially prepared.

Artificial alizarin contains several other products, one only of which is of practical value. This is anthrapurpurin ($C_{14}H_8O_5$), and was discovered by Perkin; it has the same composition as purpurin, but quite different properties. Calico printers at first had much difficulty in producing always the same shades with artificial alizarin, owing to the fact that it contained pure alizarin and anthrapurpurin in varying quantities. This difficulty has been overcome by separating the colouring matters; that consisting of almost pure alizarin, which dyes a bluish-red, being called "blue alizarin," while anthrapurpurin is termed "red alizarin." For a full description of the most important patents and modes of manufacturing this valuable colouring matter see "Chemistry, Theoretical, Practical, and Analytical," articles "Alizarin" and "Coal-tar Distillation."

AL'KALI. This word is compounded of the Arabic article *al* and *kali*, the name of the plant by burning which a saline mass is obtained containing the alkali in question. The alkalies are numerous, and they are all compound substances. They do not result, however, from the action of any specific or alkalinizing principle, being very variously constituted. All exist in nature, and can be artificially formed. The early chemists looked upon them as elementary bodies. Lavoisier first suggested that alkalies were metallic oxides. This was proved to be the case by Sir Humphry Davy in 1807. In recording the isolation of potassium in the Laboratory Book of the Royal Institution, he naively remarks, "a capital experiment." He followed this up by the separation in succession of all the metals of the alkalies and alkaline earths.

The chemical and distinguishing properties of the alkalies are, that their aqueous solutions turn litmus which has been reddened by an acid, blue; vegetable blues and red cabbage liquor, green; and vegetable yellows (such as turmeric) reddish-brown, and syrup of violets, red. Turmeric and litmus in solution, or paper dyed with these colours, are commonly used as tests of the presence of an alkali. The alkalies restore the colour of vegetable blues which have been reddened by acids, and, on the other hand, the acids restore vegetable colours which have been altered by the alkalies. The alkalies are separated at the negative pole of the voltaic battery.

They have a great affinity for water, and very readily absorb aqueous vapour from the atmosphere. They precipitate metals from acid solutions as oxides or hydrates. Their chief characteristic is the facility with which they unite with acids to form salts. Alkalies, strictly speaking, are only three in number, viz. soda, potassa, and ammonia. These are termed inorganic, to distinguish them from organic alkalies, which are, however, more properly called **ALKALOTONS**. Strontia, baryta, magnesia, and lime are alkaline earths. They were distinguished from the alkalies proper by Duhamel in 1736. Pure anhydrous alkalies are very acid and caustic, destroying nearly all animal and vegetable tissues. They absorb moisture from the air with great avidity, are readily soluble in water and alcohol, and form with carbonic acid salts very soluble in water. The alkaline earths are less caustic, and are sparingly soluble in water and alcohol. They completely neutralize the strongest acids; with weak acids they form alkaline salts.

Concentrated aqueous solutions of alkalies act as violent corrosive poisons, and are used in surgery to open

abscesses or to form caustic issues. Diluted with oils they constitute rubefacients, particularly ammonia. Their causticity is also greatly lessened by combination with carbonic acid, and is more subdued by an excess of the acid; hence bicarbonates are less caustic than sesquicarbonates, and these last than carbonates. The carbonic acid is apt to fly off on exposure to the air, so that they regain their causticity. Carbonate of ammonia will altogether disappear if not kept in a well-stopped bottle; this tendency is one source of its utility when used as smelling salts.

Ammonia and its carbonates are very pungent. They exercise an immediate influence on the fluids of the mouth and alimentary canal, as far as they pass unchanged. That they neutralize all acids they meet with in their course, and render the mucus, and perhaps some other secretions, thinner and more watery; that they are readily absorbed into the circulating mass, on which they have a marked influence, is certain; but they are for the most part speedily eliminated, the kidneys appearing to be the channels by which they are thrown out of the system. Many alkaline compounds, as well as the uncombined but diluted alkalies, increase the secretion of urine, and change its nature if long persevered in, altering it from an acid to an alkaline state. The alkalies possess a power of rendering albumen soluble: unboiled white of egg is an albuminate of soda. The albumen of the blood is rendered more fluid by alkalies; hence in excess they impair the plastic power of that fluid. When alkalies are taken unnecessarily or persevered in too long, much evil is done; not only is an alkaline state of urine induced, with a deposition of the phosphates, as indicated by a white sabulous sediment, or an iridescent pellicle on the surface of the urine, but much general debility is caused.

The manufacture of caustic soda and carbonate of soda from common salt is extensively carried on in Lancashire, Northumberland, and Glasgow, and is termed *par excellence* the "alkali trade." The hydrochloric acid which is evolved, although itself a valuable product, is somewhat difficult to condense, and as its diffusion is very offensive and highly detrimental to all animal and vegetable life, an Act was passed in 1863 requiring that every alkali establishment shall condense at least 95 per cent. of the gas evolved therein. A report of the medical inspector in 1880 showed that the Act has been extremely beneficial since it came into operation.

ALKALOIDS (organic alkalies, organic bases). The first alkaloid was discovered by Sertürner in 1804. The discovery attracted but little attention until 1817, when he demonstrated that this body (to which he gave the name of morphine) combined with acids, forming neutral salts soluble in water, and in alcoholic solution altered vegetable colours in the same manner as the mineral alkalies. Since that time it has been discovered that nearly all vegetable extracts which act upon the nervous system owe their power to the presence of alkaloids. They now number over 200.

Alkaloids possess alkaline properties in the lowest degree, and are either tasteless or have a bitter acid taste, existing generally in a solid, mostly crystalline form. Some, however, are amorphous (aconitine), occasionally in a liquid state (conia and nicotine), the latter very volatile, and readily undergoing decomposition with an evolution of ammonia, at a moderate temperature. Most of the alkaloids correspond in composition with ammonia (NH_3), and form salts by direct combination with acids, and without separation of water. They commonly contain carbon, nitrogen, hydrogen, and oxygen. The point in which they differ most from the common alkalies (except ammonia) is in having nitrogen in their composition, one of them (caffeine) being perhaps the most highly nitrogenized

compound known. Sometimes only one exists in a plant, sometimes several in the same plant, as in opium. Generally they are combined with an acid; most frequently it is a peculiar acid. Many of them are with difficulty soluble in water, more so in alcohol; they rarely completely neutralize acids, but the salts which they form are more soluble than the bases; hence various of their salts are used in medicine in preference to the primitive article. Very many alkaloids are now prepared artificially. Few of these contain oxygen. The most important artificial alkaloid yet discovered is aniline, produced by the reduction of nitro-benzole. Morphine, strychnine, quinine, brucine, aconitine, atropine, cinchonine, codeine, caffeine, narcotine, nicotine, veratrine, are the alkaloids with which we are most familiar.

The detection of alkaloids in chemico-legal investigations was first systematized by Stas in 1851. Later researches have rendered easy the separation of a very small quantity of an alkaloid from a very complicated mixture of vegetable and animal matter, so that what was formerly feared to be a great public danger has been completely removed.

AL'KANET is the common name given to plants belonging to the genus *ANCHUSA*.

Anchusa officinalis (common alkanet bor ugles-) has narrow leaves and deep purple flowers. When young it is sometimes boiled and eaten. The roots contain a considerable quantity of gum, and when boiled yield a demulcent drink, which was once in repute as a medicine. In China this plant is used as a provocative of the eruption of small-pox.

Anchusa tinctoria (the bugloss or alkanet) is cultivated in the south of France for the sake of the root, which yields a fine red colour to oils, wax, and all mucuous substances, as well as to spirits of wine. Its chief use is in colouring lip-salves, ointments, &c. It is, however, sometimes employed for staining wood and dyeing cotton. It is also used for colouring many of the beverages sold under the name of port wine, likewise the corks used for the bottles in which this fluid is sold.

ALKMAAR ("all sea," from the lake or morass which formerly surrounded it) is a strongly fortified and well-built town in North Holland, on the Helder Canal, 25 miles N.N.W. of Amsterdam. It is intersected by broad canals, lined with trees, and has exceedingly pleasant environs of excellent gardens and rich meadows. This town is the greatest cheese depot in the world, and also a great butter market. It has manufactures of sail-cloth, salt, and leather, and a population of about 13,000. Damask weaving was invented here in the sixteenth century by Lammertyn; and it is the native place of Drebbel, the inventor of the thermometer, who was born in 1572. The Duke of Alba unsuccessfully besieged Alkmaar in 1573; and in 1799 the Russo-British army, under the Duke of York, here signed a capitulation, after having been twice defeated by the French.

ALL-HALLOWES, ALL-HALLOWMAS, or simply **HALLOWMAS**, the old English name for All Saints' Day, or the 1st of November.

All-Hallowmas derives its importance from the popular usages which in our own and other countries have sometimes distinguished the day itself, but more generally the night preceding, called its eve or vigil. There is reason to believe that this was a pagan before it was transformed, according to a well-known practice of the Roman Church, into a Christian festival; and there can, at any rate, be no question that the ceremonies to which we refer are of Druidical origin. Bonfires, bell-rings, and domestic merry-makings, in which "lamb's wool" (ale or wine mixed with the pulp of roasted apples) was the principal beverage, marked the eve of Hallowmas. The season called for such demonstrations: the harvest was over, the winter at hand.

But the eve of All-Hallows is especially famous for those observances which have been wont to take place on it, connected with the superstitious wish of prying into futurity. The same ceremonies of this description appear to have been anciently practised in England, Ireland, and Scotland; but they are now almost universally disused. The well-known poem of Burns, "Hallowe'en," will immortalize the ancient ceremonies which it relates. In the Roman Catholic Church the festival is set apart for the commemoration of all those saints and martyrs to whom no particular day is assigned.

ALL SAINTS' BAY, a large and commodious bay of Brazil, in the province of Bahia, 37 miles by 27, within which it is computed that secure anchorage could be found for all the navies of the world. It contains several fertile islands, the largest of which is Itaparica. The town of Bahia, or San Salvador, stands on its right shore.

ALL SAINTS' DAY. See ALL-HALLOWE'N.

ALL SOULS' COLLEGE, Oxford, was founded in 1437 by Henry Chichele, archbishop of Canterbury, to be called "The College of the Souls of all the Faithful Deceased" (*Collegium omnium Animarum fidelium defunctorum de Oron*).

The college was originally founded for a warden, forty fellows, two chaplains, and clerks, but the following alterations have recently been made:—

Ten fellowships have been suppressed for the endowment of two professorships—the Chichele professorships of "international law and diplomacy" and "modern history."

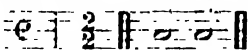
All preferences and disqualifications in election to fellowships have been abolished; and it is now only provided that "no person shall be eligible who shall not have passed all the examinations required by the university for the degree of Bachelor of Arts, and shall not either have been placed in the first class in one at least of the public examinations of the university, or have obtained some prize or scholarship within the university open to general competition." The peculiarity of All Souls' College is that it has no students. There is a very fine chapel attached to it, the greater part of which was rebuilt and the whole thoroughly restored in 1876.

ALL SOULS' DAY, a festival of the Roman Catholic Church, held on 2nd November. Its object is, by supplication and abstinence, to relieve souls in purgatory. On this day the relatives and friends of deceased persons usually place fresh *immortelles* on their tombs or graves.

ALLA BREVE or **ALLA CAPELLA**, in music, is $\frac{2}{2}$ time, with four minims, that is, the value of a breve in a bar; whence its name. It is especially found in the older church music (*Gaudeamus de capella*), whence its second name. If now used, the bar of the old alla-breve time is divided in half, and written with two minims in a bar ($\frac{2}{2}$), and two beats only. To distinguish alla breve from ordinary common time ($\frac{4}{4}$), which, with the same value of notes, but in the shape of four crotchets, has four beats in a bar, C is used instead of C if the time is not indicated by figures.



1. Old Alla-breve Time Signatures and Value.



2. Modern Alla-breve Time Signatures and Value (two beats in a bar only).

For instance, Handel's chorus, "All we like sheep" ("Messiah"), was written in the time of the illustration No. 1, and marked *alla breve*, but is now always printed in $\frac{4}{4}$ time (illustration No. 2), for convenience in performance.

AL'LAH is the Arabic name of the Supreme Being, to whose worship all Mohammedans are pledged, and which

is used throughout the Koran. It is properly "the Worthy to be Adored," from the definite article *al*, and *illah*, to be adored. The Arabic conception of the Supreme Being has many points in common with those that prevail among Jews and Christians, though the teaching of Mohammed was directly opposed to the doctrine of the Trinity as held among Christians. The following Mohammedan creed will sufficiently describe the doctrine on this subject as accepted by the followers of the Prophet. "There is no God but the God (Allah). This only true, great, and highest God has existence of himself; is eternal, not begotten, and begets not; is sufficient of himself; fills the universe with his infinity; is the centre in which all things unite, visible and invisible; lord of the material and spiritual worlds; creator and ruler; all-mighty, all-wise, all-good, merciful; whose decrees are irrevocable."

AL'LAHABAD', a division, district, and city in the North-western Provinces of British India.

ALLAHABAD DIVISION includes the six districts of Cawnpore, Fatehpur, Banda, Allahabad, Hamirpur, and Jaunpur, and is under a commissioner. It lies between 24° and 26° N. lat., and 79° and 83° E. lon. The length of the province from E. to W. is 270 miles, and the average breadth from N. to S. about 120 miles. The area is 13,422 square miles, and the population in 1881 was 5,600,000.

ALLAHABAD DISTRICT lies between 21° and 25° N. lat., and 81° and 82° E. lon., and is bounded on the N. by Partagarrh, S. by the native state of Rewa, E. by Mirzapur and Jaunpur, and W. and S.W. by Fatehpur and Banda. It has an area of 2747 square miles. The country between the Jumna and the Ganges, within which this district mostly lies, is well watered, highly cultivated, and fertile, producing rice, wheat, and other kinds of grain, and a great variety of fruits; but in the southern part are to be found stony ridges covered with jungle, the haunt of wolves, leopards, and wild boars. The climate in the hilly districts is hot and dry. The dry winds are less trying in the low country, and in the rainy season a cool wind generally blows.

Allahabad is one of the most populous and productive provinces in the Indian empire. Indigo is largely manufactured, and the industry next in importance is that of stone-cutting, the stone being mostly obtained from Shiorajpur, and thence carried in boats to Ballághát. In some villages brass, copper, and iron vessels are manufactured; at Manauri the East Indian Railway has an extensive cast-iron factory. The exports consist of indigo, grain, hides, paper, sugar, cotton, and cotton cloths, opium, and saltpetre; also diamonds, which are found in small quantities at Panna, in the district of Bundelkhand. The principal means of communication, beside the rivers, are the East Indian Railway and the grand trunk road. This district passed out of the hands of the Nawab of Oudh to the British by treaty in 1801. The population in 1881 was 1,450,000.

ALLAHABAD CITY ("Abode of Allah"), the capital of the North-west Provinces, and the seat of the government of the division and district of the same name, is situated about 500 miles W.N.W. of Calcutta, at the junction of the rivers Ganges and Jumna. An extensive fortification is erected on the tongue of land where these streams unite, so as to completely command the navigation; from this the military cantonments are 4 miles distant.

Allahabad was a favourite residence of the Emperor Akbar, who may be said to have been the founder of the modern city and of its fortifications. Inside the fort—which was built in 1583—are portions of a beautiful palace, now used as an arsenal. In 1765 the fort was taken by Sir Robert Fletcher, but was afterwards restored to the Nawab of Oudh, and again transferred to the

East India Company in 1801. Allahabad stands in an extremely favourable situation, on a dry and healthy soil; it has easy communication with Calcutta and Bombay, and is the seat of British military, civil, and judicial establishments; it has greatly increased in prosperity in consequence of the opening of the line of railway from Calcutta to Delhi, on which it is a chief station. The East Indian Railway spans the Jumna by a splendid iron girder bridge, and two bridges of boats cross the Ganges. The population in 1881 was 150,000, of whom the Hindus and Mohammedans are the most numerous. To the former Allahabad is still known by its ancient name of Prayag. Inside the fort inclosure stands the celebrated pillar of Asoka—a great Buddhist emperor about 240 B.C.—near which is an underground temple containing the “undying Banian tree.” This place of worship, it is asserted, is erected on the spot where the three sacred streams the Ganges, Jumna, and Saraswati unite; the latter is not visible, and in fact loses itself in the sand some 400 miles distant. Allahabad is on this account much resorted to by pilgrims, who annually flock to a great religious fair, known as the Magh Melâ, their numbers sometimes approaching 250,000. It lasts the whole month, but the great bathing day is at the full moon, when it not unfrequently happens that many are drowned either by design or accident. The only considerable buildings, besides the fort, are the Junâ Masjid, in good repair but little frequented, and Prince Khursi's serai and garden. The serai is a large quadrangle with four fine Gothic gateways, and surrounded by cloisters for the accommodation of travellers. Among modern erections are the Government House, standing in a park-like inclosure, European barracks, and the Roman Catholic cathedral; also the Muir University College, for the special study of the vernacular languages, established in 1873, and the Mayo Memorial and town-hall. The native town consists of narrow streets, and although possessing substantially built edifices, contains mud hovels, standing on the ruins of ancient brick buildings. The European quarter is beautifully laid out, and with its broad roads lined with trees, and fine buildings and public gardens, presents a handsome appearance.

Allahabad is the third city in size in the North-western Provinces, and though not possessing any manufactures of importance, is, from its situation, a place of considerable commercial activity. It was the scene of serious massacre and destruction at the Sepoy mutiny in 1857. The insurrection was promptly suppressed by Colonel Neil, who marched from Benares.

ALLAN, BRIDGE OF, a beautifully situated village in Stirlingshire, 8 miles N. of Stirling, and 31 N.W. of Edinburgh by rail. It is much frequented by visitors to the Airthrey mineral wells, which are more than 100 feet above the village, at the foot of the Ochil Hills. They contain chiefly chloride of sodium and calcium. There are several churches and hotels; also a library and collection of statuary and paintings. There are several fine seats in the neighbourhood. The population in 1881 was 3004.

ALLAN, DAVID, a painter, was born in 1741, in Allon, in Clackmannanshire, where his father was shore-master. The choice of his profession was partly owing to an accident; he burned his foot, and while he was being nursed at home, having nothing else to do, he amused himself with drawing with a piece of chalk upon the floor, an amusement he got so much attached to, that he was turned away from school for making caricatures. A friend was so much struck with these that he recommended Allan's father to allow him to become a painter. He was accordingly apprenticed in 1755, his eleventh year, to Robert Foulis, to learn drawing, painting, and engraving. Allan remained at this academy nine years, and when he returned home he was generously sent by the resident families of

Cathcart, Erskine of Mar, and Abercromby, to prosecute his studies at Rome. He raised hopes, however, while at Rome, which he never realized afterwards. He obtained first a silver medal for a drawing in the Academy of St. Luke, and afterwards the gold medal for painting. He painted other pictures at Rome; and he also made four humorous designs illustrating the Roman Carnival, which, through Paul Sandby's prints of them, became very popular. But he did nothing to deserve the title of the “Scottish Hogarth,” which for these and a few other similar designs he obtained in Scotland.

In 1777 Allan visited London, and practised for a short time as a portrait painter, but subsequently went to reside at Edinburgh. After the death of Ranciman, in 1786, Allan succeeded him as master of the Trustees' Academy, which office he held for ten years, until his death in 1796. Allan's most popular designs are his Twelve Illustrations of Ramsay's “Gentle Shepherd,” which he engraved himself in aquatinta.

ALLAN, SIR WILLIAM, R.A., President of the Royal Scottish Academy, was born in Edinburgh in 1782. He was at an early age a fellow-student of Wilkie in the Edinburgh School of Design. Allan left Edinburgh for London, but meeting with but little success he resolved to seek his fortune in Russia. After some difficulties he reached St. Petersburg in 1805, where he was befriended by some of his countrymen, and obtained considerable reputation. He returned to England in 1814, and exhibited his “Circassian Captives” at the Royal Academy in the following year. In 1816 his picture was the “Siberian Exiles.” The purchase of two of his pictures by the Russian grand-duke Nicholas added largely to his fame, and enabled him to undertake those works by which his reputation was established. In 1830 he was compelled, by a severe attack of ophthalmia, to relinquish painting, and travel in search of health. He visited Italy, Turkey, Greece, and Asia Minor, and during his journey added largely to his store of materials. In 1835 he was made a Royal Academician. In 1838 he was elected president of the Royal Scottish Academy, and in 1841 he was appointed limner to Her Majesty for Scotland—receiving knighthood in 1842. In 1841 he again went to St. Petersburg, and painted at the request of the Emperor “Peter the Great teaching his Subjects the art of Shipbuilding,” which was exhibited in London in 1845, and is now in the Winter Palace of St. Petersburg. He subsequently produced, among other works, two pictures of the Battle of Waterloo, one being taken from the French and the other from the English positions—the first of which was bought by the Duke of Wellington. He died on the 22nd February, 1850, leaving unfinished a large picture entitled “Bruce at Bannockburn.”

ALLANTOIN. This substance exists in the allantoic liquid of cows, and has since been obtained by Liebig and Wöhler artificially by treating uric acid with lead dioxide. It has the form of brilliant colourless crystals derived from the rhomboid, with a vitreous appearance. It is insipid, does not act upon vegetable colours, dissolves in 160 parts of cold water and thirty parts of boiling water. It is soluble in alcohol and nitric acid; its formula is $C_4H_6N_4O_3$. When heated in the dry state it is decomposed into ammonium cyanide and carbonate, carbon, and a small quantity of an empyreumatic oil. Heated with nitric acid, urea and allanturic acid ($C_3H_4N_4O_3$) are formed. Boiled with alkalis, ammonia is given off and oxalates produced.

ALLECTUS, Roman Emperor in Britain. He had been a general of the Emperor CARACALLA, who on the strength of his position in Britain, then a very important province, had made good his claim to a share in the empire. Allectus murdered him A.D. 293, and himself assumed the title of Emperor of Rome.

After a struggle of three years against the general

CONSTANTIUS CHLORUS, whom DOMITIAN had sent over from Rome, Allectus fell in battle A.D. 296. Constantius himself became emperor eventually, and was succeeded by his son **CONSTANTINE THE GREAT**, who accompanied him in this important British campaign.

ALLEGATION, ECCLESIASTICAL, was the term applied to the first plea in testamentary causes; in criminal proceedings (ecclesiastical) the first plea is called *articles*; in plenary or ordinary causes the first plea is called *libel*. This first plea is analogous to a declaration at common law, or to a bill in equity. The term allegation is also applied to every subsequent plea in all causes. The first plea given in by a defendant is called a *responsive allegation*; the plaintiff's answer to that is called a *counter allegation*. The pleadings are not usually carried beyond this step. Besides these allegations, either party in the case is allowed to except to the credit of any witness upon matter contained in his deposition. These exceptive allegations, when admitted, are proceeded upon in the same manner as other pleas. (Phillimore's ed. of Burn's "Ecc. Law.")

ALLEGHANY, a river, 300 miles in length, which has its source in Potter county, Pennsylvania. The Ohio is formed by the union of this river with the Monongahela at Pittsburgh, beyond which town the Alleghany is navigable for 200 miles.

ALLEGHANY MOUNTAINS, a name often applied to the **APPALACHIAN MOUNTAINS** in the United States, but more correctly to that portion of the range which is situated in Pennsylvania and Virginia.

ALLEGIANCE or **LIGEANCE** is thus described by Coke:—"Ligeance, a ligando, is the highest and greatest obligation of duty and obedience that can be. Ligeance is the true and faithful obedience of a liegeman or subject to his liege lord or sovereign. Ligeantia est vinculum fidei: Ligeantia est legis essentia." The notion of ligeance, or allegiance, is that of a bond or tie between the person who owes it and the person to whom it is due. ("C. 117," 129 a.) Allegiance is due from those who are natural-born subjects, and also from denizens and those who have been naturalized. A natural-born subject is called a natural liegeman, and the king is called his natural liege lord.

The allegiance of a subject was formerly regarded as permanent, and as the law stood before 1870 every person born within British dominions owed an allegiance from which he could not relieve himself. By the Naturalization Act, passed in 1870, any British subject may renounce allegiance to his own country by becoming naturalized in another. [See ALIEN.] An alien owes allegiance while he is within the dominions of the king, and he may be prosecuted and punished for treason.

By the old oath of allegiance the party promised "to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and to renounce honour, and not to kill or bear of any ill or damage intended him without defending him therefrom." The modern oath, enacted in 1868 (31 and 32 Vict. c. 72), is, "I do swear that I will be faithful and bear true allegiance to Her Majesty Queen Victoria, her heirs, and successors according to law. So help me God."

The king can, by proclamation, summon his liegemen to return to the Kingdom, an instance of which occurred in 1497, when the King of England, declaring that the kingdom was menaced and endangered, recalled from foreign service all seamen and seafaring men who were natural-born subjects, and ordered them to return home, on pain of being proceeded against for contempt. It was further declared that no foreign letters of naturalization could divest natural-born subjects of their allegiance, or alter their duty to their lawful king.

By the old law every male subject of the age of twelve years (with certain exceptions) was bound to take the oath of allegiance when summoned to the courts called Leets and Tourns; and various statutes, from the reign of Queen Elizabeth to the present century, have required it from public functionaries and other persons before they enter upon their respective duties, or practise in their several professions. By 1 George I. c. 13, two justices of the peace, or other commissioners appointed by the king, may tender the oath to any person who is suspected of disaffection.

A violation of allegiance is high treason.

If a foreigner is naturalized here he owes allegiance to the British crown. But if, as is nearly always the case, he still continues to owe allegiance to his former state or sovereign, his new allegiance may, under certain circumstances, as for instance in time of war, place him in a difficult situation.

ALLEGORY, literally a discourse which has another meaning than what is directly expressed. Thus the address of Menenius Agrippa to his fellow-citizens of Rome, as recorded by Livy (ii. 32), in which he described a rebellion of the industrious against the wealthy orders of a state, under the figure of a conspiracy of all the other members of the human body against the stomach, was an allegory. The poets of different nations have resorted to this method, in order to convey sufficiently vivid conceptions of the different virtues and vices, and other abstractions. They have personified these notions, as it is termed. Such pictures are allegories, and are to be found abundantly scattered over nearly all poetry.

Of all poetical allegories the "Faery Queen" of our own Spenser is the most famous and the greatest; no other poet has either produced so vast a number of personified abstractions, or put into them such a spirit of life and air of actual existence. Most of Spenser's personages also typify the leading persons of his age—the "Faery Queen" is therefore an allegory within an allegory.

Among prose writers the names of Swift and Addison rank high with those who have achieved success in this method of composition; but the pre-eminence must assuredly be given to the immortal "Pilgrim's Progress" of John Bunyan.

ALLEGRI, ANTONIO. See CORREGGIO.

ALLEGRI, GREGORIO, a famous musical composer (1580–1652) under Pope Urban VIII. He is best known by the jealously guarded "Miserere," to copy which incurred excommunication, but which Mozart carried away in his memory from the Sistine Chapel, where alone it was performed. This was a wonderful feat, considering that it is in nine parts, and written for two separate choirs. Mozart wrote it out at home, and revisited the chapel with the music concealed in his hat to insure its correctness. The work itself is in a simple style; but as sung during the ceremonies of Holy Week in the Sistine Chapel, without accompaniment, according to the practice of that choir, it has a marvellous effect, being then embellished with elaborate *fiorituri*, handed down by tradition, and almost impossible to reproduce on paper or to imitate. Yet all the florid passages (*fiorituri* or *embellimenti*) are so delicately introduced as not to disturb the exquisite sadness of the whole, and its perfect adaptation to the words of the "Miserere" (the 51st Psalm). Mendelssohn excellently describes the effect, and notes down some of the *embellimenti* in a letter to Professor Zelter. (Mendelssohn's "Letters from Italy and Switzerland.")

Allegri was of the same family as the great painter Correggio (Antonio Allegri).

ALLEGRO, in music, one of the principal *tempi* or indications of pace. Its literal meaning in Italian is "cheerful," and Milton's famous poem "L'Allegro" has it

in this sense. But its original character is now quite lost, and it signifies simply "quick." It is intermediate between *andante* and *presto* (fast). *Presto* signifies simple rapidity as a rule, but *allegro* has countless modifications, the most important of which are—*allegro agitato*, quick and with emotion; *allegro mosso* or *allegro assai*, very quick; *allegro con brio*, *con spirito*, *con fuoco*, quick, with fire; *allegro non troppo*, quick, not too much so; *allegro vivace*, quick and lively.

Allegretto, rather quick, generally used as indicating a movement of a graceful character not quite so quick as *allegro*. *Grazioso* (graceful) and *scherzando* (sportive) are two of the adjectives most often qualifying *allegretto*.

ALLELU'IA. See HALLELUJAH.

AL'LEMANDE or **ALMAIN.** 1. An ancient German dance in $\frac{3}{4}$ time, probably with a springing step. It loses much of its original dance character when forming part of the "suites" of Handel, Bach, &c., where it is usually a florid melody with a simple accompaniment, and is always either the first movement in the suite or immediately succeeds the *prelude*.

2. A sort of slow German waltz, as in Beethoven's "12 Tänze für Orchester."

3. A lively modern kind of *contre danse* in $\frac{3}{4}$ time, German.

The name simply means "German," whence its various applications. The first is musically the most important.

ALLEN, BOG OF, the name applied to a series of morasses in King's County and Kildare, Ireland, comprising more than 238,000 English acres. They extend from within 17 miles of Dublin westward almost to the Shannon, although they are interspersed by tracts of arable land. The Grand Canal crosses this district, and in it the rivers Barrow, Brosna, and Boyne take their rise. The Bog of Allen is about 250 feet above the sea, and the depth of peat about 25 feet. Lough Allen, in county Leitrim, is regarded as the source of the Shannon.

ALLEYN, EDWARD, was born 1st September, 1566, in the parish of St. Botolph without Bishopsgate, London. In 1592 he married Joan Woodward, the daughter by a first marriage of the wife of Philip Henslowe, one of the principal theatrical managers of that day. He entered into partnership with his father-in-law, and became such a thriving man as to be able in 1606 to purchase the manor of Dulwich from Sir Francis Calton.

He commenced the building of Dulwich College in 1613, and it was completed in 1616. Previous to this he seems to have discontinued appearing on the stage as an actor. The college, named "God's Gift College," was for the support and maintenance of one master, one warden, and four fellows, three of whom were to be ecclesiastics, and the other a skilful organist; also six poor men, six women, and twelve boys to be educated in good literature. The patent passed the great seal on the 21st of June, 1619, and on the 13th of the following September Alleyn formally and publicly dispossessed himself of this the greater part of his property, and thenceforward he and his wife lived in this foundation upon a footing of equality with those whom they had raised into comfort and comparative opulence. In 1620 he founded some almshouses in Finsbury. His diary gives us a curious picture of his habits after his retirement to Dulwich. His wife Joan died in 1629. He was very soon married again to a lady whose Christian name was Constance, and who is supposed to have been a daughter of the celebrated Dr. Donne. Alleyn lived with his second wife only about two years. His will, dated 13th November, 1626, states that he was sick in body; and on the 25th of the same month he died, and was buried in the chapel of his college.

The founder of Dulwich College had a singular partiality for persons bearing his own name, and intended the master always to bear the name of Allen or Alleyn. In consequence

of the increase in the value of the property the revenues of Dulwich College are now very large. A new building, for the education of 600 boys, was opened in 1870. Alleyn left a collection of pictures there, to which additions were gradually made; but in the year 1810 Sir Francis Bourgeois bequeathed to the college his valuable collection (which he had previously offered without success to the government), upon the condition of a gallery being built for its reception; and thus raised the "Dulwich Gallery" to its present high reputation. It is easily accessible to the public without fee.

The papers at Dulwich College, whether in the writing of Alleyn or his partner Henslowe, throw some light upon the literary history of the drama. Alleyn appears to have been a man of a kindly heart towards those with whom he was brought in contact; and all these documents show that the theatrical writers—some of them men who have earned immortality—were for the most part poor and wretched. Perhaps some of the higher excellence of Shakspeare may be attributable to the fact that he was at ease in pecuniary matters and not dependent upon managerial caprice; that, in fact, he was making a fortune, as Alleyn himself was making it, by his property in a species of enterprise which had universal supporters, and which, in his case, had the especial support of the wealthiest and best educated of the community.

AL' LIER, a department of France formed out of the province of Bourbonnais, is bounded N. by the departments of Nièvre and Cher, E. by those of Saône et Loire and Loire, S. by that of Puy de Dôme, and W. by those of Creuse and Cher. The department, which lies between 45° 58' and 46° 47' N. lat., and between 2° 21' and 3° 57' E. lon., measures 111 miles from E. to W. and 55 from N. to S. It contains 2840 square miles, and the population in 1882 was 116,759.

The department is a vast plain, with an inclination from S. to N.W., diversified by some gentle undulations, and in the S. by two ranges of hills which respectively lie between the Bebre and the Allier, and the Allier and the Cher. The surface for the most part consists of a primitive soil, resting on granite, or in the south on limestone; but in the centre the soil is alluvial. Coal, iron, and antimony are found; granite, marble, and limestone are quarried; mineral springs are found at several places, but those of Vichy, Neais, and Bourbon-l'Archambault are most frequented. The ponds and rivers of the department abound in excellent fish, which are sent to the Paris markets, as are also large numbers of leeches. There are extensive forests of good timber.

The principal river is the Allier (the ancient *Flarier*), which rises in the north-east of the department of Lozère, after leaving which it flows through those of Haute Loire, Puy de Dôme, Allier, and Cher, passing the towns of Briende, Issoire, Vichy, and Montlus, and falls into the Loire about 4 miles below Nevers, having run from N. to S. a course of 220 miles, of which 88, from St. Arcons in Haute Loire to Mariol in Allier, are available for floating timber; and 79 miles, from Mariol to the Cher, are navigable. Its principal affluents are the Dore on the right, and the Sioule, which receives the Boule, on the left. The south-east of the department is drained by the Bebre, which rises in the department of Loire, and enters the river Loire a little below Dompierre, after a course of 47 miles almost entirely within the department. The Loire and the canal along its banks lie on the E. of the department, the Cher crosses it in the W., as does also the Berry canal, which commences at the coal-mines of Commentry, passes Montluçon, and runs parallel to the Cher as far as St. Amand, in the department of Cher.

The quality of the land is in general good, especially along the courses of the Allier and the Sioule; corn is

grown in great quantity, and the vine is cultivated. Oxen and sheep are fattened on the rich pasture lands for the supply of Paris and Lyons; the veal of Montluçon is highly esteemed. The bulk of the population is employed in agriculture; but the quarries and mines of the department, as well as its manufactures of cutlery, hats, linen, serge, carpets, porcelain, and glass, give employment to a considerable number. The chief trade of the department is in provisions, cattle, iron, wood, and coal.

The department is divided into four arrondissements; and the chief towns are Moulins, Gannat, Cusset, Montluçon, and Vichy.

ALLIGATOR, a word of uncertain origin, but now adopted by naturalists as the generic term of a group of crocodiles peculiar to the New World. They are fierce carnivorous aquatic reptiles, of large size, covered above with a coat of mail, consisting of bony plates of moderate size imbedded as it were in the skin, and covered externally with a hard coriaceous cuticle: these bones are generally furnished with a ridge or crest, which adds to their strength, and they form altogether an admirable panoply of defence. The tail is long, thick, muscular, compressed, and ridged above. The limbs are short. The front feet have five toes, of which the two outermost are destitute of a nail. The hinder feet have each four toes more or less united by intervening webs. The head is flat above, furrowed and rugose. The jaws are enormous, and armed with numerous teeth in a single row; these are of unequal length, conical, and hollow at the base, the cavity of each receiving the germ of the tooth destined to replace it. The teeth are separated from each other, the intervals mutually receiving the teeth of the opposite jaw, when the jaws are closed. The alveolar orifice is protected by a strong movable valve, capable of being raised or shut down at pleasure. The eyes are small but bright, with a vertical linear pupil; they are protected by eyelids and a membrana nictitans. The nostrils are valvular, and seated close together on the extremity of the muzzle; the nasal passages do not open into the mouth, but into a post-nasal space, divided from the cavity by a valvular cartilaginous expansion of the os nasale, which is so accurately adjusted to a depending portion of the palate as to bound the back of the mouth; thus, if the nostrils be raised above the water, these animals may keep the mouth open below, or hold their prey while it is drowned, themselves breathing all the time at ease. In the act of swallowing, the valve is drawn down by the action of the muscles of deglutition, so as to form a passage free, through which the food is propelled in large masses. The space between the two branches of the lower jaw is muscular, and covered internally with a yellow skin full of glands, whence oozes a viscid saliva. This glandular skin represents the tongue. Beneath the throat are two large mucus-glands, whence exudes a strong sticky humour. The vertebrae of the neck are furnished with stout false ribs which overlap each other, and render all motion difficult; hence these reptiles cannot turn so nimbly as they pursue their prey on land, and are therefore the more readily avoided. The abdomen is protected and supported by an arrangement of bones called abdominal ribs. Alligators are the only saurian reptiles destitute of clavicles, but the coracoid processes of the scapulae are attached to the sternum. These large reptiles swim by lashing the tail from side to side, and often as they urge their way leave a foamy track behind them. When surprised on land they always make at once for the water; for it is there only that they can effectually exert their formidable strength. On the land they are awkward, turn as we have said, with difficulty, and are by no means swift, so that a man may easily outstrip them. When, however, they are intercepted, they defend themselves with fury, snapping violently, and striking from

right to left with their tail, a single blow of which will level the most powerful man; hence they are not to be dispatched without difficulty and danger. They are often captured by means of baited hooks, or sharp-pointed pieces of wood, and by harpoons, and are dragged by main force on shore, there to be destroyed.

In the stomach of these reptiles it is very common to find stones of various sizes, which have been swallowed, as some suppose, to form a sort of ballast, but most probably, as the stomach in its structure and form bears a close resemblance to that of a fowl, in order to bruise down the food, and thus assist in the process of digestion.

The eggs equal those of a goose or of a swan in size, and are covered with a parchment-like membrane. The females of some species watch their eggs, deposited in the sand, and conduct the young to the water. Both eggs and young are liable to great destruction from beasts and birds of prey. Alligators and caymans are distinguished from the true crocodiles by having the head very broad, the muzzle depressed and obtuse; the teeth are unequal, and the fourth (canine) on each side from the front of the lower jaw is elongated, and received into a cavity of the upper jaw when the mouth is closed, and not as in the crocodiles into a notch. The hinder limbs are destitute of the ridge of acuto scales down the hinder margin so conspicuous in the true crocodiles, and the webs between the toes are much less developed.

The alligators, like the crocodiles, are oviparous, and bury their eggs in the sandy or muddy earth of the banks of rivers, leaving them to be hatched by the natural heat of the sun. These fierce reptiles haunt the more tranquil parts of rivers, creeks, and lakes; and in some remote districts abound in great numbers; they may be seen basking in the sun on the banks or in the water, their large flat heads protruding through the leaves of aquatic plants, which spread around in luxuriance. It is during the night principally that they are active in the pursuit of prey, chasing fishes or seizing on whatever animal comes in their way; while driving the shoals before them they often utter loud bellowsings which may be heard at a considerable distance. These savage and powerful animals seldom attack men except in defence of their eggs or young, yet there are not wanting instances in which persons bathing or swimming across rivers have fallen victims to their ferocity, and dogs and pigs are very frequently snatched up. If their prey be too large to swallow at a single mouthful, they bury it beneath the bank of the river till it easily falls asunder from putrescence.

According to Dr. Gray there are three genera—Alligator, Caiman, and Jacaré. The pike-headed alligator (*Alligator lucius*) is found in the Mississippi, in the rivers of Louisiana, Florida, Georgia, Carolina, and Savannah. It hibernates during the cold season, burying itself under the mud at the bottom of swamps and marshes, and becomes so completely torpid that it may be cut to pieces without exhibiting signs of animation. It attains to the length of 14 or 15 feet, and appears to exceed other alligators in ferocity. It is gregarious in its habits, numbers uniting in chase of fishes, which they catch by diving under the shoal; having secured one they rise to the surface, throw it into the air, and catch it in its descent, instantly gorging it—a plan by which the necessity of swallowing water with it is avoided. The voice resembles the bellowing of a bull.

The banded caiman (*Caiman palpebrosus*) has the eyelids bony. It is a native of Cayenne, Surinam, Guiana, and Brazil. The black jacaré (*Jacaré nigra* or *Alligator sclerops*) is a native of Guiana and Brazil. The natives appear not to fear them, and do not hesitate to bathe and swim in the rivers frequented by them. (See *PLATO CROCODYLIA*.)

ALLITERATION, a term usually employed to signify the frequent recurrence in composition of words commencing with the same letter, when introduced with a view to its rhetorical effect. Byron's line in the concluding stanza of the second canto of "Childe Harold,"

"O'er hearts divided, and o'er hopes destroyed,"

may be given as a fine example. Churchill has at once ridiculed and exemplified the figure in his well-known verse,

"And apt alliteration's artful aid,"

where every word begins with the same letter. Modern critics have detected numerous instances of alliteration both in the Latin and Greek poets. (See the dialogue entitled "Actus" in the "Latin Dialogues" of Joannes Jovianus Pontanus; and Harris' "Philological Inquiries," part ii. chap. iv.) Perhaps the most astounding Latin instance is a mediæval poem by the musician HUCHALD, preserved by Barthius ("Adversaria," 46, xxii.) It is dedicated to Charles the Bald of France, very rightly, since it is in praise of baldness. It contains over 100 lines, every word in which begins with C. We quote the concluding two:—

"Conveniet claras claustris componere cannas
Completur clavis carmen cantabile CALVIS."

Alliteration, however, has been most systematically used as an ornament of diction in the Celtic and Gothic dialects. Dr. Percy, in an essay published in his "Reliques of Ancient English Poetry," has traced the origin and history of alliterative verse down from the composition of the old Icelandic poets. The remains which we possess of Saxon poetry are also constructed upon the principle of alliteration, the rule governing which may be roughly summarized as follows. The poem is in pairs of short lines, each line carrying two accented syllables, so that although the number of syllables varies greatly the rhythm is well preserved. The first line of the pair has two words beginning with a certain letter, and the second line must have its first accented word beginning with the same letter.

The most celebrated of the poems in the English language entirely composed in alliterative metre, is that entitled "The Vision of Piers Plowman," written about 1360 to 1380, by William Langland, a secular priest, and a fellow of Oriel College, Oxford. We add a line or two, marking the accents, and printing two lines in one:—

"I was wea'ry, forwa'd'ered, and went me to rest,
Under a broad' bank' by the burn'-side;
And as I lay' and lean'd and look'ed in the wa'ter,
I slum'ber'd in a sleep'ing it sound'ed so mery."

This is a long work, consisting of twenty-one parts or books, and composed throughout in verses the cadence of which appears to be generally anapestic, but which are evidently designed to derive their chief metrical beauty from alliteration on the Saxon rules above mentioned. The poem has been frequently printed; the best edition is that published by Mr. Wright, with Introduction, Notes, and Glossary, in two vols., London, 1842.

Our popular ballad and lyrical poetry is full of such lines as those with which the Scotch song commences—

"Merry may the maid be
That marries the miller;
For foul day and fair day," &c.

The occasional use of alliteration as an ornament continues to characterize English versification in its most polished form; but the only extensive use of it in modern times as a mode of versification after the old models is in the later operas of the poet-composer Wagner, who handles it with consummate mastery and success. For musical purposes its freedom proves to be far better fitted than the comparative monotony of rhymed and measured verse.

AL'L'IUM, a very extensive genus of plants, belonging to the order LILIACEÆ. The flower-leaves are distinct from each other, and are six in number. The anthers are attached by their backs. The flowers all spring from the same point in the stalk. The species are all remarkable for having, in a greater or less degree, the odour of garlic, and for the agreeable stimulating effects that accompany it.

Allium Cepa (the common onion) is too well known to require description. It is not certain of what country it is a native, but it has from time immemorial been cultivated in Egypt. Its varieties are not very numerous, considering that it is almost exclusively increased by seed; the most remarkable are the blood-red, which is the most pungent; the Strassburg, which is the hardest; the silver-skinned, which is the smallest and the best for pickling; and the Portugal and Tripoli, which are the largest and the most delicate. In this country the bulbs do not generally arrive at the large size of those imported from Portugal and Spain; but skillful gardeners have nevertheless succeeded in procuring them fully as fine.

Allium Schenoprasum (the chive) is a little tufted plant, the leaves of which are the part eaten, and they are cropped as occasion requires.

Allium fistulosum (the Welsh onion) is a native of Siberia, and is cultivated chiefly for the purpose of being sold in the markets when very young, at which time its flavour is delicate. Its hardness enables it when young to brave our spring cold better than the common onion.

Allium ascalonicum (the shallot), a native of Asia Minor, is in many respects similar to the chive, from which it is known by its larger leaves, its smaller and more deeply-coloured flowers, and its stamens having alternately three points on the filaments. Two very distinct varieties of this useful plant are known, one of which is much larger and more delicate than the other. To obtain the bulbs in the greatest perfection they should not be buried in the earth, as is the common practice, but merely placed on the surface of the soil.

Allium sativum (garlic) has been found wild in Sicily and some parts of Provence.

Allium Ophioscorodon (tocambole, or Spanish shallot) is very slightly different from garlic. It is a native of most parts of the south of Europe; it is little cultivated in this country.

Allium porrum (the leek) has, like many other cultivated plants, disappeared in a wild state, so that its origin is unknown.

As the sensible properties of the whole genus are evidently much the same as those of the common onion, differing chiefly in degree of concentration or diffusion, the chemical analysis of the bulbs of this species may be considered illustrative of that of all the rest. MM. Fourcroy and Vauquelin found that the common onion is composed, 1, of a white, acid, volatile oil, holding in solution sulphur which renders it fetid; 2, of a vegeto-animal matter analogous to gluten; 3, of a good deal of uncrystallizable sugar; 4, of a great quantity of mucilage, resembling gum-arabic; 5, of phosphoric acid, either free or combined with lime, acetic acid, and a little citrate of lime; and 6, of vegetable fibre. It is to the volatile oil that the irritating properties of the onion are owing, and they are consequently dissipated by heat.

AL'LOA, a seaport town in the county of Clackmannan, on the north bank of the Forth, where the river widens into an estuary, 7 miles from Stirling, and 27 from Edinburgh. The population in 1881 was 9687—an increase of 1385 from 1871. The town is ancient, but there are some handsome houses and good shops, and altogether the place has a prosperous appearance. The church is an elegant structure in the Gothic style, and has a spire 207 feet high. There are places of worship for all denominations. The

town also contains handsome municipal buildings, erected in 1872; hospital, literary institute, and a grammar and several other schools. There are also a corn exchange, a county court-house, and a custom-house.

The town contains several large distilleries and breweries, woollen manufactories, glass-works, corn and flour mills, and an iron foundry. Bricks, tiles, and other earthenware, copper goods (especially distillers' apparatus), leather, tobacco, and snuff, are also extensively manufactured, and there is a good trade in corn. Large quantities of coals are raised in the neighbourhood. Allea possesses a commodious harbour, and vessels of large burden can lie close to the quays. There is a dry dock, two yards for shipbuilding, and a spacious wet dock. The number of vessels registered as belonging to the port in 1885 was twenty (2500 tons). The entrances and clearances each average 1000 (135,000 tons) per annum. There is steam communication with Stirling and Edinburgh, and a good foreign trade—chiefly with Holland and the Baltic. The imports consist of corn, wool, timber, &c.; the exports are coals, and the many industrial products of the town and neighbourhood. Allea is supplied with water from Gattowre Dam, which is fed from the Black Devon river. The stream which issues from this dam, besides supplying the town, turns several mills. Near the town is an ancient tower 90 feet high, which was built at the commencement of the fourteenth century, and was formerly the residence of the Erskine family—descendants of the earls of Mar. Allea is supposed to have been built on the site of the Roman station of Pitoma.

ALLOCU TION, a word meaning an address, and originally applied to the address of a commander to his soldiers. It is now restricted to the addresses delivered by the pope to the College of Cardinals on ecclesiastical or political matters. These may be regarded as official utterances, and they are frequently used by the court of Rome to define the position of the church, or to assert its claims.

ALLODIUM, a kind of tenure, property held in absolute dominion, without rendering any service or fealty to a superior. It is opposed to *feodum* or *feif* [See FEUDAL SYSTEM], which means property the use of which was bestowed by the proprietor upon another, on condition that the person to whom the use was made should perform certain services to the giver, upon failure of which, or upon the determination of the period to which the gift was confined, the property reverted to the original possessor. Hence arose the mutual relation of lord and vassal.

It is the general opinion that the lands which the Germanic tribes—Franks, Burgundians, and Visigoths—seized during the decline of the Roman empire, were distributed among the members of these tribes free from all service or duty. Land so held was called *allod*, or *alod*, and in the Latinized form, *allodium*. The system of fiefs, or the feudal system, as it is called, was posterior to that of this allodial holding of lands; and it was not completely established in France, till towards the end of the tenth century. It was not till about Alfred's time, and till the papal intrigues from the Danes, that free holders of land put themselves for safety under the protection of a lord, but once begun, the practice of necessity grew up, and in a few years the "lordless" man disappeared as an entity.

King and the Norman Conquest put an end to allodial tenure, and all land is held mediately or immediately of the king. Our law for the most absolute dominion is *feodum* or an estate *en fee*, a word which implies a feudal relation. When a man possessed of an estate in fee dies without issue, and without having devised his property, the estate reverts or falls back to the lord of whom it was held in, or where there is no intermediate lord, to the king as lord paramount.

The Latinized forms of this word are various—*alodia*, *alodus*, *alodium*, *alaudum*, and others. The French forms are—*aleu*, *aleu franc* or *frank aleu*, *franc-aloud*, *franc-aloy*, and *franc-aleuf*. In many old charters *alodium* is explained by *hereditas*, or heritable estate.

There is a very elaborate article on allodial land in the "Staats-Lexicon" of Rotteck and Welcker, under the head "Alodium."

ALLOP'ATHY, the system of medical treatment ordinarily followed, as contradistinguished from that of homœopathy. See HOMŒOPATHY.

ALLO'RI, the name of two distinguished Italian painters, father and son, though different in style.

The father, Alessandro Allori, was born at Florence in 1535, and was brought up by his uncle, Angelo Bronzino, likewise a very distinguished painter. From his connection with his uncle he was frequently called Bronzino. He was one of the most distinguished painters of the anatomical school, and was a devoted admirer of Michael Angelo. He died in 1607. Allori's works, both in oil and fresco, are numerous, and many on a large scale.

The son, Christofano Allori, born at Florence in 1577, was a better painter than his father. He studied with Gregorio Pagani, and rivalled that painter in richness of colour, and surpassed him in delicacy of execution. But he was idle and fastidious, and his works are scarce. In execution he was equal to anything, and he had of course a corresponding skill in copying. He died in 1621.

(Baldinucci, "Notizie de' Professori del Disegno," &c. Lanzi, "Storia Pittorica," &c.)

ALLOTMENT SYSTEM. See AGRICULTURE.

ALLOTROPISM (from Gr. *allotropos*, in another manner). This word was first made use of by Berzelius to designate that property by which an element may have, in different states, very diverse chemical and physical characteristics. Of late years the term has been applied to compounds also. See ISOMERISM.

ALLOWANCE, in commerce, a deduction from the gross weight of goods agreed on between merchants according to the customs of particular countries and ports, the chief of which is known by the name of TARE. It is also used in connection with the army to describe the amounts allowed to officers in addition to their regular pay in consideration of special duties, travelling expenses, &c. In the navy the daily supply of food is termed by the sailors their allowance, the corresponding word used in the army being *rations*.

ALLOXAN, a crystalline body, was discovered in 1817 by Brugnatelli, who called it erythric acid. It is a product of the oxidation of uric acid. Wohler and Liebig, who gave it its present name, obtained it by the action of nitric acid on uric acid. Anhydrous alloxan is of a pale red colour. The crystals, obtained by evaporation of an aqueous solution, have the form of an octahedron with a rhombic base; they are colourless, transparent, very brilliant, often an inch in diameter, and contain $\frac{2}{3}$ atoms of water. They effloresce rapidly, and are converted into the monohydrated variety, which is also produced when a hot saturated solution of alloxan is made to crystallize; the alloxan is then obtained in oblique rhombic prisms. Alloxan is very soluble in water; it possesses a disagreeable smell, and a somewhat astringent saline taste. It reddens litmus, and renders the epidermis purple. Its formula is $C_4H_2N_2O_6$.

ALLOXAN'IC ACID. This was produced by the action of the alkalis upon alloxan by Wohler and Liebig in 1838. It crystallizes in hard white needles, which are permanent in the air; they have a sour taste, and are soluble in water. Their aqueous solution reddens litmus. Alloxanic acid neutralizes bases perfectly, and decomposes the carbonates; when neutralized by ammonia it gives a white precipitate in solution of silver nitrate, which becomes

yellow by ebullition, and afterwards black with effervescence. Alloxanic acid dissolves zinc with the evolution of hydrogen gas. Its formula is $C_4H_4N_4O_6$.

ALLOXANTIN, a crystalline substance, obtained either from uric acid or from alloxan. It was discovered by Prout, but first fully described by Wöhler and Liebig. The crystals are colourless, and in the form of oblique four-sided prisms; they become red when exposed to the air; and they are hard and fragile. Alloxantin is slightly soluble in cold water, but more soluble in hot; its solution reddens litmus paper. The alkalis decompose it; and when heated in a solution of chlorine it is converted into alloxan. Its formula is $C_6H_4N_4O_7 + 3 H_2O$.

ALLOY (from the French *aloi*, i.e. standard of coin, *à la loi*). This word is employed to designate either a natural or artificial compound of two or more metals, except when mercury is one of them, in which case the mixture is called an *amalgam*. Native or natural alloys considered as such are not useful bodies; the only exception, if indeed it may be so reckoned, is the alloy of iron and nickel, constituting *meteoric iron*, of which the knives of the Esquimaux appear to be made; but artificial alloys are of the highest importance, since by uniting different metals, compounds are formed which possess a combination of qualities not occurring in any one metal. Gold, silver, tin, antimony, and bismuth are generally alloyed, the first three on account of their softness, and the two latter because they are extremely brittle. Gold and silver are hardened by alloying with copper; copper is hardened by zinc, &c.

The formation of alloys to some extent depends upon the chemical affinity of the metals for each other, though most alloys appear to be mixtures, the metals dissolving in one another in any proportions; and in some instances it seems to be wanting, for no combination occurs; thus, according to Gellert, bismuth and zinc do not combine. Various facts may be assigned for supposing the combination to be the result of chemical affinity. Thus Berossigault analyzed six different native alloys of gold and silver, and found in all cases that the metals were combined in the proportions of 4, 5, 6, or 12 atoms of gold to 1 of silver; the tendency of some alloys to crystallize also affords evidence of chemical combination. This is particularly noticeable in the case of bronze, a mixture of copper and tin; brass, the mixture of copper and zinc; German silver, copper and nickel; and aluminium bronze. If these mixtures are severally slowly cooled, and the supernatant liquid poured off from the solid metal, crystals are left which are found to contain definite compounds of the metals in proportions of their atomic weights. The change of properties which metals undergo by combining, likewise furnishes strong evidence of its arising from chemical affinity and action; thus with respect to colour, copper, a reddish metal, by union with zinc, which is a white one, gives the well known yellow alloy brass. Again, the fusing point of a mixed metal is never the mean of the temperature at which its constituents melt, and it is generally lower than that of the most fusible metal of the alloy.

All alloys formed of brittle metals are brittle; those made with ductile metals are in some cases ductile, in others brittle; when the proportions are nearly equal there are as many alloys which are brittle as ductile; but when one of the metals is in excess they are most commonly ductile. In combining ductile and brittle metals the compounds are brittle if the brittle metal exceed, or nearly equal the proportion of the ductile one; but when the ductile greatly exceeds the brittle the alloys are usually ductile. The density of alloys sometimes exceeds, and in other cases is less than that which would result from calculation.

Not only are the properties of metals altered by combination, but different proportions of the same metals pro-

duce very different alloys. Thus, by combining 90 parts of copper with 10 parts of tin an alloy is obtained of greater density than the mean of the metals, and it is also harder and more fusible than the copper; it is slightly malleable when slowly cooled, but on the contrary, when heated to redness and plunged into cold water it is very malleable. This compound is known by the name of *bronze*. If 80 parts of copper be combined with 20 parts of tin the compound is the extremely sonorous one called *bell-metal*; an alloy consisting of two-thirds copper and one-third tin is susceptible of a very fine polish, and is used as *speculum metal*.

It is curious to observe in these alloys that in bronze the density and hardness of the denser and harder metal are increased by combining with a lighter and softer one; while, as might be expected, the fusibility of the more-refractory metal is increased by uniting with a more fusible one. In bell-metal the copper becomes more sonorous by combination with a metal which is less so. These changes are clear indications that chemical action has been at work.

ALLUVIUM (Latin *ad, to*, and *luo*, to wash) or **ALLUVIAL DEPOSITS**, a name given to those accumulations of sand, earth, and loose stones or gravel brought down by rivers, which, when spread out to any extent, form what is called *alluvial land*. The word is also applied to accumulations formed by the sea along the shore.

There are three successive stages in the formation of alluvium—viz. the crumbling of the mineral crust of the earth by the action of tides, current, storms, and atmospheric agency; the transportation of the loosened fragments; and their deposition in the form of alluvium at the bottom of rivers, estuaries, and the ocean.

The mineral substance of most rocks have a tendency to combine with the oxygen of the atmosphere under particular conditions of heat, moisture, and electricity; carbonic acid and water are absorbed by many rocks; vicissitudes of temperature tend to expand, contract, split, and disintegrate rocks; lightning often shivers a rock into innumerable fragments; every shower of hail or rain washes off fragments more or less numerous from the surface of rocks; so that by these combined agencies of air, moisture, carbonic acid, heat, electricity, hail, and rain, there is a constant wearing away of the substance of solid rocks. It is true that these agencies work very slowly, when the bulk of the rock is considered; but time in geological phenomena is reckoned by ages or centuries instead of by years.

Another kind of agency is the power of a running stream to wear away the banks and rocks against which it rubs. The force of water, when directed against any obstacle in its course, is very considerable, even by its own weight alone, especially if it be flowing over a highly-inclined surface; but its destructive power is greatly augmented if it be loaded with sand and gravel. In floods very considerable blocks are carried by the stream to great distances, for it must be remembered that these are much more easily moved in water than on land, in consequence of the law of hydrostatics, that a solid body fully immersed in water weighs so much less than it does in air by a sum equal to the weight of the mass of water which it displaces. If the water flows with a velocity of 3 inches per second, its force, when free from suspended matter, is sufficient to tear up fine clay; 6 inches per second, fine sand; 12 inches per second, fine gravel; and 3 feet per second will tear up beds of loose stones of the size of an egg. Instances have been recorded in most countries of masses of stone, weighing from 100 to 1000 lbs., having been transported many miles by the force of a current.

The formation of *ravines* by the erosive power of running water is another cause of the accumulation of alluvium. The explanation of this subject more fittingly belongs to

another article [see VALLEYS], but it may here be observed that there is abundant proof of the power of water to cut a passage through solid rock. In Sicily, the river Simeto has cut a passage for itself through a bed of very hard rock, 50 feet deep and several hundred feet wide. The river Nerbudda, in India, has worn away a rock to the depth of 100 feet. Among the Alps, gorges have been scooped out to the depth of 600 or 700 feet by the action of running water alone, and some of the cañons in Colorado—which have also been cut out by the action of water—have a depth of from 1000 to 1500 feet. Such facts as these are sufficient to show that a rapidly-flowing river exerts a powerful disintegrating force.

The wearing and transporting powers of rivers depend upon the volume of water, the quantity and size of the solid matter suspended, and the velocity with which it moves. A river generally runs with greatest rapidity in the higher parts of its course, where indeed it often consists of a succession of torrents and cataracts for many miles, but it has not yet acquired its full destructive force, because the mass of water is still comparatively small, nor has it yet become loaded with solid matter. In the lower part of its course, long before it joins the sea, it has usually reached a level country, and there its velocity becomes greatly retarded. The loss of destructive power, by diminished velocity in the level country, is sometimes compensated in a considerable degree by the effects produced by the weight of the great volume of water impinging upon certain parts.

The tortuous course of rivers, when they are cut through solid rock, as in the case of the Moselle, whose banks are sometimes 600 feet high, are among the strongest proofs of the destructive power of running water; for no sudden deluge, however powerful, could have scooped out such a trough; and that a cliff of such a nature should be occasioned by any disruption of the earth's crust is not less improbable. More sudden, and therefore more striking, instances of the waste of the land occur where a river flows through a lake, and by its wasting action causes a breaking down of the barrier.

The distance to which the detached fragments are carried depends upon the volume of water, and the nature of the ground over which it flows. The torrents from the south-western Alps, rushing over a steep uninterrupted slope, transport large blocks to the sea; but a river that runs through a long stretch of level country deposits the grosser matter in the upper part of its course, and carries to its mouth only that which is more easily held in suspension. The larger stones, after being detached from their parent rock, have therefore to undergo an intermediate process of abrasion, by being rubbed against each other in the bed of the stream before their particles are finally comminuted to the slope. If a river pass through a lake in its course, the solid matter will be deposited in that trough until it has filled it up; and if the lake be very large, even the lighter particles will have time to fall, and the water will flow out clear from the oil or extremity. Such processes are now going on by the gradual filling up of the Lake of Geneva by the Rhone, of the Lake of Constance by the Rhine, of the Lake of Wädenswil by the Linth, and of many other lakes which have rivers flowing through them. In other cases the bed of the river itself is gradually raised by the deposition of this alluvium, and then is often turned out of its course. This process has occurred so often in Lombardy that the inhabitants are obliged to make artificial banks to confine the river to its proper limits.

In a mountainous country where the land rises rapidly from the base of the rivers, depending over a steep bed,

formed at the mouth of the river—that is, the sea forms a deep indentation into the land of a triangular shape. If, on the other hand, a low shelving shore, and the absence of strong tidal currents, favour the gradual and tranquil deposit of the solid matter brought down by the river, an extensive level of alluvial land is formed. In this case the main river, at a distant point inland, often divides itself into two streams, which, gradually diverging until they reach the sea, inclose a triangular space of land having the form of the fourth letter of the Greek alphabet (Δ), and hence called a *delta*. The mass of water does not, however, long continue divided into two streams only; the process of separation is repeated several times, and thus the delta is traversed by several channels, and the great river empties itself into the sea by many mouths. Such a delta is formed at the mouths of the Nile, Mississippi, Ganges, Rhine, Rhone, Po, Danube, Volga, Indus, Orinoco, and many other rivers. Great as is the amount of new land thus formed, it is but insignificant in comparison with the quantity of solid matter carried down by rivers and deposited in the depths of the sea. The quantity of mud and sand poured by the Ganges into the Bay of Bengal is so great in the flood season that the sea recovers its transparency only at the distance of 60 miles from the coast. Sir C. Lyell showed that, supposing the water to contain one-hundredth part of solid matter, a mass equal in bulk to the greatest of the Pyramids of Egypt is brought down by the Ganges every day. If a current runs across the mouth of such a river it gives rise to the formation of a sand-bank, and greatly accelerates the accumulation of the delta.

Such, then, are the numerous modes in which alluvium is formed, and fitted to become the basis of a rich vegetable soil, by converting into dry land tracts which were before covered with water.

Besides this erosive action of rivers, there is an enormous power due to the sea itself. An extensive waste of the land is in constant progress along every line of coast which presents an abrupt face to the sea. The amount and rapidity of that waste depend upon a variety of circumstances: the nature of the rocks of which the cliffs are composed, according as they are capable of long resistance or are easily acted upon by the weather and the sea; the force of the tides and currents; the greater or less frequency of storms—all these accelerate or retard the destructive force of the ocean. In this case also, as well as in the action of running water on the land, the force is greatly augmented when the water is charged with solid matter. The violent surge of a tempest dashing against a cliff detaches large blocks, and sweeps them away; but the next returning wave hurls them back again against the cliff, and thus a powerful artillery is supplied by the land for its own destruction. The east and south coasts of Great Britain, the Shetland and Orkney Islands, the shores of Denmark, and many other sea-coasts of Europe, show evident signs of the power of the sea to encroach upon and wash away the cliffs, thereby adding to the quantity of alluvium brought down by the rivers.

The movement and accumulation of shingle on the sea-shore is due to the action, not of tidal currents, but of wind waves. On the south coast of England, for instance, the prevailing winds are from the south-west, and the shingle therefore travels in an easterly direction; the pebbles are regularly sorted, the larger ones being to leeward, owing to their greater momentum, and to their not being so much influenced by the recoil wave as sand and the smaller pebbles.

ALMA, a river in the Crimea, flowing into Kalamita Bay, about 17 miles north of Sebastopol. At the commencement of the Crimean War the allied armies of Great Britain and France won a brilliant victory on its banks over the Russians, 20th September, 1854. The Russian army,

numbering 36,000 men, occupied a strong position on the left bank of the river, under the command of Prince Menschikoff; while the combined forces consisted of 25,000 British, with sixty guns, under Lord Raglan, and 30,000 French, with sixty-eight guns, together with 7000 Turks, under Marshal St. Arnaud. The steady advance of the British, who waded through the stream amidst a heavy fire, greatly contributed to the victory. The Russians were completely routed, and threw away their arms and knapsacks in their flight. Their loss was about 5000 men—of whom 900 were made prisoners, mostly wounded. The British loss was twenty-six officers and 327 men killed, and seventy-three officers and 1539 men wounded. The French lost three officers and 233 men killed, and fifty-four officers and 1033 men wounded.

ALMA MATER (Lat. "fostering mother"), a term used in reference to the university or college at which a person has been brought up.

ALMACK'S, a suite of assembly rooms built in 1765 in King Street, St. James, by a tavern-keeper named McCall, who had inverted his name on account of the prejudice then existing in London against Scotchmen. The rooms became of great celebrity owing to the large and fashionable balls held there under the management of a committee of ladies of the highest rank, and the name became a symbol of strictly aristocratic society. They are now called Willis's Rooms, from the name of a subsequent proprietor.

ALMADEN or **ALMADEN DEL AZOQUE** (Arabic. "the Mine of Quicksilver") is a town of Spain, in the province Ciudad Real, about 130 miles S. by W. from Madrid, and 55 from Ciudad Real. It is situated in the north slopes of the Sierra Morena, and is clean and well-built. It is the *Cisapoma Cetobrix* of the Romans.

Almaden is famed for its mines of quicksilver, which have been known for more than 2000 years. The hill in which the mines are found is 120 feet high; and the cinnabar (ore of mercury) is met with in different parts of the mass. The galley-slaves who worked in these mines were not exposed to the hardships that are commonly believed. They only worked three hours a day, and did nothing but take out the earth in wheel-barrows. The inhabitants of Almaden work double the time, except during the hot season of the year, when, owing to imperfect ventilation, the operations are nearly brought to a stand-still. Convict labour is now no longer employed here.

The cinnabar occurs in veins which traverse the hill; and pure mercury is also found in crevices of sand-stone and slate. For roasting the ore ovens and other apparatus are provided. Each oven is capable of containing 10 tons' weight of stone, and is kept burning for three days. Until the finding of similar mines in New Almaden in California these were the most productive in the world. They are worked by vertical shafts, a depth of 1000 feet having been reached; and it is found that the quality of the ore improves as the depth increases.

The average amount of quicksilver annually produced is about 2,000,000 lbs. Almaden has a school of mines and three hospitals. Its population is about 10,000.

There is a smaller but similar mine about 50 miles south, near Cordova.

ALMA GRO, a town of Spain, 12 miles E.S.E. from Ciudad Real, in the province of that name. It is a handsome well-built town, situated in a fertile plain, and contains several churches and monasteries, mostly in ruins. Monks and knights were formerly the chief residents. The manufacture of brandy, earthenware, and soap is carried on, and lace-making forms an important industry both here and in the villages near. The district is celebrated for its mules, which, as well as the lace, are sold at two great annual fairs. Population, 14,000.

ALMA GRO, DIEGO D', one of the adventurers

who went from Spain to the conquest of America. He was a foundling, but nothing further is said of him by the historians previous to the year 1525, when he joined with Pizarro and a clergyman named Hernando de Luque, at Panama, to undertake the conquest of Peru. Pizarro took the command of the troops; Almagro engaged to procure the supplies of men, arms, and provisions; and Luque was to remain at Panama to forward the interests of the company. Pizarro set out first, and Almagro afterwards joined him. Some time after the execution or murder of the Peruvian Atahualpa, Francisco Pizarro was informed of the arrival of Pedro de Alvarado with some troops to undertake the conquest of Peru, and sent Almagro to them to ascertain their intentions. Almagro met them on the coast, near the present port of Callao. After some negotiation the greater part of the troops of Alvarado, tempted with the offer of 100,000 gold crowns to be divided among them, joined their fellow-countrymen and marched to the town of Cuzco. Almagro was informed by one of this party that he had been appointed governor of Nueva Toledo, and from that time disputes arose between him and Pizarro as to the extent of the authority of each. Almagro seized Cuzco, but ultimately submitted to Pizarro, and was sent to the conquest of Chili. In 1535 he set out on his march, in which he crossed the Andes from Cuzco, and traversed the desert of Atacama to the plains of Chili, a distance of 350 leagues. After having suffered much fatigue and privation, he subdued several tribes of Indians, and it is said acquired 600,000 ducats in pieces of gold. He then returned, seized Cuzco, and imprisoned the two brothers of Pizarro; but was attacked in the town and taken prisoner by Pizarro, who caused him to be tried by a court-martial, which condemned him to death for having rebelled against his general, and abandoned his post. This sentence was executed at Cuzco on the 25th April, 1538, Almagro being then in the seventy-fifth year of his age.

AL'MANACK, a word of Eastern origin, probably derived from the Arabic word *al*, the definite article, and *manah*, to reckon. In the modern acceptance of the term it refers to an annual publication, giving the civil divisions of the year, the movable and other feasts, the times of the various astronomical phenomena, such as the rising and setting of the sun, the changes and phases of the moon, eclipses, times of high water, and a variety of additional information of a statistical, political, commercial, agricultural, or social character.

The belief in astrology, which has prevailed in the East from time immemorial, must have rendered the use of tables of the movements of the heavenly bodies absolutely necessary, but no such tables have been preserved to us. In Rome the knowledge of the calendar and the dates of the various feasts, legal terms, &c., was for a long period jealously guarded by the priests; but about 300 B.C. a list of them was publicly exhibited by one Cn. Flavius, who had secretly possessed himself of the necessary information. In subsequent periods calendars were engraved on stone tablets, several of which are still in existence. The Alexandrine Greeks, in and after the time of Ptolemy, constructed and used almanacks; but the earliest in Europe of which Lilande could obtain any notice are those of Solomon Jarchus, published about 1150. Manuscript almanacks written in the years 1292, 1300, 1327, and 1380 are preserved in the libraries of the British Museum, and of the Oxford and Cambridge Universities. The earliest European almanack of importance was that published by the astronomer Purbach, 1450-61, and the first printed almanack known was published in 1457. In 1475 a pupil of Purbach, named Regiomontanus, printed and published under royal patronage an almanack which was continued for thirty years—till 1506—which was valued very highly at that period. The first almanack

printed in England was translated from the French, and published in 1497. In the following century numerous almanacks were published in France, and the political predictions they contained attracted so much attention that in 1579 Henry III. forbade all makers of almanacks to prophesy, directly or indirectly, concerning the affairs either of the state or of individuals—a prohibition renewed by Louis XIII. in 1628. The popularity of these predictions, however, proved too strong for royal ordinance, and the publication of prophetic almanacks has continued up to the present day—large numbers being still circulated among the ignorant peasantry. Among these perhaps the most famous is the *Almanach Liegeois*, first published in 1636, and still enjoying a large sale in rural districts.

In England, during the reign of Elizabeth, the monopoly of the right to sell almanacks was granted to two members of the Stationers' Company, and this was extended by James I. to the Universities of Oxford and Cambridge and the Stationers' Company jointly; and the universities having commuted their right, in consideration of an annuity, the company enjoyed the monopoly until the year 1775, when it was successfully disputed by a bookseller named Thomas Carnan. The aim of the company seems to have been to make as much as possible out of their privilege, and the only question considered was whether the publication would sell. Thus in 1624 they issued one almanack containing the customary predictions, and another in which all such prognostications were derided and branded as lying. The most famous of those published by the company were the *Vox Stellarum* of Francis Moore, dating from 1680, and *Poor Robin's Almanack*, a coarsely humorous production, which was published from 1663 to 1828. The *Vox Stellarum*, better known as *Old Moore's Almanack*, is still published, though the hieroglyphic and predictions have been discontinued during the last few years. So recently as 1820 the editors of *Moore's Almanack* left out a column in which the subtle influence of the moon on the different members of the body was traced and recorded. The editors probably thought that the public had outgrown such nonsense, but they were careful enough to issue only 100,000 copies with the modification, and the result showed that they were more slow than the public. The omission was detected, and nearly the whole issue was returned to the publishers, who were obliged to recover their popularity and to reprint the column! The first almanack wholly free from astrological nonsense was published in 1828 by the Society for the Diffusion of Useful Knowledge, and was entitled *The British Almanack*. It was bought by the Stationers' Company in 1869, and is still published by them, forming a very useful record of astronomical and general knowledge. At the present period almanacks are published in immense numbers of endless variety. Some contain, in addition to the calendar, information of a special character, and are designed to serve ecclesiastical, literary, or commercial purposes. Small publishers, too, seldom and print no home ventures largely use almanacks as a means of advertising.

Among almanacks of more general use may be mentioned *The Companion to the British Almanack*, issued by the Stationers' Company, containing a record of the events of the year; *Whitaker's Almanack*, which contains a large amount of useful information; *Green's Royal and Ecclesiastical Almanack*, which extends to nearly 1000 pages and contains a mass of information on all public affairs; and *Thorn's Irish Almanack*, an equally excellent work of still greater dimensions.

On the Continent perhaps the best known is the *Almanach de Gotha*, which has existed from 1764, is published in the French and German, and contains a full account of the princely and royal families of Europe, together with a large amount of statistical information.

In addition to those works intended for general use there have been published during the last two centuries numerous astronomical and nautical almanacks, wholly devoted to these studies. The oldest of them is the French *Connaissance des Temps*, commenced in 1679 by Picard, and which is continued at the present time. The first of this kind published in England was the *Nautical Almanack*, which was projected by Dr. Maskelyne, then astronomer-royal, and which appeared in 1767. In this the employment of lunar distances for the finding of the longitude was first introduced—a method of great value, which was speedily adopted by the French and other nations of the Continent. Dr. Maskelyne continued to superintend its publication for forty-eight years, during the whole of which period its excellence was maintained; but after his death it ceased to improve, and at last became so insufficient that in 1830 the government requested the Astronomical Society to investigate the subject. The committee appointed by the society proposed numerous alterations, all of which were adopted by the government, and the first almanack containing them was issued in 1834. It is published by the Admiralty, is generally issued three years in advance, and is of the highest utility in navigation. Similar works are published by France, Germany, and America.

ALME or **AL-MAI** (i.e. "the learned"), the name given by the modern Egyptians and Arabs to the dancing and singing girls of Egypt. They form a particular class of society, living together in bands, who are distributed in the various towns, or travel about the country in quest of employment. They are present at all festivals and marriages, and other ceremonies. The girls admitted into this society have generally a fine voice; they learn by heart the best songs on romance and love; and some are also able to sing extempore verses, after the manner of the Italian improvisatori. But they chiefly excel in pantomimic dances, which represent the various incidents of life, and, above all, the passion of love. The Bayadeers of India are a sort of Al-mai. See BAYADEER.

ALMEIDA, a strongly-fortified city of Portugal, in the province of Beira, 25 miles from Ciudad Rodrigo in Spain. Population, 7000. The town lies between the rivers Coa and Turones, both tributaries of the Douro. The Spaniards took it in 1762, after a long and bloody siege. It was captured by Massena in 1810, but abandoned by him to an Anglo-Spanish army under Wellington on the 9th of May, 1811.

ALMERIA, a province at the south-east extremity of Spain, formerly part of the old provinces of Granada. It is bounded by Jaen and Murcia on the N., by the Mediterranean on the E. and S., and by Granada on the W., and has an area of 3300 square miles. Various high mountain ranges intersect the province, including some spurs of the Sierra Nevada, in which are the celebrated marble quarries of Macael. Minerals are found in abundance, the silver mines of the Sierra de Almagrera and the lead mines of the Sierra de Gador yielding a large output. The principal rivers are the Almanzora, 50 miles in length; the Almería, which rises at the foot of Mulapacen, one of the loftiest mountains in Europe; and the Adra. The fertile plains and valleys, in which cattle are largely reared, produce all kinds of grain and fruit. Silk is cultivated in the west, and cotton and the sugar-cane are grown. The chief manufactures are cordage, shot, white-lead, saltpetre, earthenware, and leather. Esparto, harilla, soap, and lead are exported, while the imports comprise cotton and woollen stuffs, silk and linen, as well as coal and machinery from England. The extensive bay of Almería and Cape Gata occur in the south. The climate is generally mild, but in the interior the winter is cold; there is but little rain on the coast.

ALMERIA (Arabic, *Al-meryah*, "the Conspicuous"), the capital, is situated on the bay of the same name, at the mouth of the river Almeria, 258 miles S.S.E. from Madrid, and 70 miles E.S.E. from Granada. It was the ancient *Murja* or *Portus Magnus*. During the time of the Moorish kings of Granada it was one of the most opulent commercial towns in their dominions.

Almeria has a good and well-fortified harbour, is the seat of a bishop, and possesses various churches, monasteries, and seminaries. The manufactures are unimportant, but a considerable export trade is carried on in wine, fruit, esparto, soda, pitch, lead, and silk. Mineral springs are found here. Population, 80,000.

ALMOHADES. See **MOORS**.

AL'MOND. See **AMYGDALUS**.

AL'MONDBURY, a large parish and township in the West Riding of Yorkshire, on the river Calder, $1\frac{1}{2}$ mile south-east of Huddersfield, of which it now forms part. In olden times it was a seat of the kings of Northumbria, and is believed to be the Roman *Campodunum*. A cathedral and castle formerly existed. Besides the church the principal institution is the Free Grammar School, established by James I. Fenay Hall, an ancient building, is in the neighbourhood. The area of the parish is 30,000 acres, and its population in 1881 was 50,000; the area of the township is 2636 acres, and the population, 13,000.

AL'MONER (once written *Almuier* and *Almuier*), was an officer in a king's, prince's, prelate's, or other great man's household, whose business it was to distribute alms to the poor.

In modern times the office of lord high almoner was long held by the archbishops of York, but it is at present filled by the Bishop of Oxford. There is also a subalmoner. The hereditary grand almoner is the Marquis of Exeter. The office of the almonry is at Westminster, and an annual distribution is made in the queen's name on the Thursday before Easter, called Maundy Thursday. A *maund* was a basket, such as may have contained the gifts.

ALMOERA, the capital of the district of Kumaon, in the North-west Provinces of India, 155 miles north-east of Delhi, is situated on a ridge of the Himalayas, 5337 feet above the level of the sea. The town principally consists of one street 50 feet wide, and three-quarters of a mile long, with a natural pavement of rock and agate at each end. The houses stand on a lower story of stone, the superstructure being of wood, an arrangement rendered necessary by the liability to earthquakes. A curious appearance is presented by the storage of hay and straw on the roofs. Although the hill tops are bleak the slopes are fertile, and tea plantations have been established with considerable success. Most of the salt from the salt-lakes of Tibet is received here. A British victory in 1815 terminated the Gurkha war, and there is now a British fort. The population in 1881 was 7000.

ALMS-HOUSE, an edifice or collection of tenements built by a private person or public company, and endowed for the maintenance of a certain number of poor, aged, or disabled people. England is the only country which possesses alms-houses in abundance, though some exist in Italy. In England they appear to have succeeded the incorporated hospitals for the relief of poor and impotent people, which were dissolved by King Henry VIII.

ALNWICK (*pron.* an'ik), the county town of Northumberland, 34 miles N. by W. of Newcastle, and 313 from London by the Great Northern Railway. It is delightfully situated on a declivity on the south bank of the river Alne, over which is a stone bridge. The town is well laid out, and the streets are spacious and well paved. The houses are of stone, of modern date, and some of them of much elegance. One of the four gates and ruins of the ancient wall still exist. The parish church, dedicated to St. Mary and St. Michael,

is a very handsome ancient edifice with a neat tower, on which stands an old beacon. It contains a *retdos*, presented in 1875 by the Duke of Northumberland. A new district church, St. Paul's, was built and endowed in 1846 by the third duke, and has a handsome east window of painted glass as a memorial to him. There is a Roman Catholic place of worship, and also chapels for all denominations of dissenters. The town-hall in the market place, situated in the centre of the town, was built in 1731, and contains a spacious hall. There are also a corn exchange, infirmary, house of correction, savings bank, mechanics' institute, and free schools. Two extensive tobacco and snuff manufactories have been erected; and the trades of tanner, maltster, brewer, and corn-miller are carried on. The market is well supplied with dairy and farm produce. The most remarkable object connected with Alnwick is the ancient castle to the north-west of the town, the residence of the dukes of Northumberland, in whose family it has been since 1310. It is built of freestone, and since its restoration by the fourth duke forms one of the most magnificent specimens of an old baronial residence in the kingdom. The exterior work was, of course, made to correspond with its mediæval character, but the staircases and staircases in the interior were entirely remodelled and decorated in the most sumptuous style of Italian renaissance. The grounds, which are 5 miles long, and through which the Alne flows, exhibit every species of natural and artificial beauty, including the remains of two ancient abbeys. The castle is 30 miles from the Scottish border, and has frequently witnessed scenes of warfare. Malcolm, king of Scotland, fell here in 1174, and at a later date William the Lion was taken prisoner. The population of the town in 1881 was 9393; of the parish, 7410.

Alnwick possesses a corporation, whose authority is not, however, exercised. It is composed of "chamberlains, common council, and freemen." Various trade guilds exist, and in order to initiate the freemen of these companies to the qualification of burghers a curious ceremony used to be observed. This involved "an absurd but not unpleasant ordeal, known as 'going through the wail';" it was, however, abolished in 1801.

ALNMOT HILL, $1\frac{1}{2}$ miles distant, and situated, as its name signifies, at the mouth of the river Alne, forms the seaport of Alnwick, and is coming into notice as a watering place.

AL'OE, a genus of succulent plants belonging to the natural order *LILIACEÆ*. It is known by having permanent fleshy leaves, the six flower-leaves being free from the pistil, and a three-lobed membranous fruit with many seeds in each cell. The drug known as aloes has been in use for 2000 years. It is the bitter resinous juice of the leaves hardened by exposure to the air. The species which has the reputation of producing the best aloes is *Aloe socotrina*. It is a native of the Cape of Good Hope and the island of Socotra. No plants can be more easy to cultivate artificially than the aloes tribe. They require a greenhouse which is capable of being maintained at a temperature not less than 40° in the depth of winter, at which time they should have no water whatever; in the summer they want no fire heat, but may be watered regularly. At the meeting of the Linnæan Society held in June, 1881, Mr. J. G. Baker exhibited the inflorescence of *Aloe Perryi*. It was the first time the aloes had been known to have flowered in this country.

The leaves are used for rope-making. The strength of the fibre has been carefully tested in France and Belgium and compared with that of hemp, the trials proving very much to the credit of the aloes. In the deep pits of Charleroi the coal is lifted by aloes rope, no other being found equally suitable.

The so-called American aloes is *AGAVE americana*.

Few more valuable drugs than aloes exist, as is proved

by the numerous preparations made either of aloes alone, or with some other articles combined with it. These combinations have various objects in view, some to heighten its powers, others to modify, and some to get rid of certain well-founded objections to its effects.

In large doses it is decidedly aperient, owing probably to its containing a crystallizable principle, which has been



Aloe Socotrina.

termed by T. & H. Smith *albin* ($C_7H_{12}O_2$), but is unlike many other cathartics, in so far that increasing the dose beyond a certain point by no means increases the effect. This can be accomplished, however, by associating it with other cathartics, and still more decidedly by uniting it with tonics, such as iron and quinine. Aloes and quinine, with antiseptic powder, and opiate powder to cover the unpleasant taste, form a combination of great utility in many gastric derangements, especially where the head is also affected. The combination which increases the purgative power of aloes in the most remarkable degree is formed by adding one drop of strong (undiluted) sulphuric acid to four grains of Barbadoes aloes, and forming a pill, two of which, given every two, four, or six hours, will almost invariably relieve the most obstinate cases of constipation, such as occur in painters' colic, &c., and other diseases. It is even more efficacious than castor oil, and not so apt to excite inflammation of the intestines.

Aloes, especially the catapogal decoction, is a most valuable emmenagogue, particularly when combined with tincture of ergot or preparations of iron. From its action on the lower part of the bowels it is deemed an improper purgative in pregnancy, or during the menstrual flux. It is also considered improper for persons subject to piles. The best means of covering the unpleasant taste of aloes when given in the Elixir form is the compound tincture of licorice.

ALOE-WOOD. See AQUILARIA.

ALOETIC ACID ($C_7H_8O_2$) is produced by the action of nitric acid upon aloes. It is an orange-yellow powder, possessing a very bitter taste. Though but slightly soluble in water, it dissolves freely, forming a red, pearly solution. This acid is monobasic; strong nitric acid converts it into chrysanic acid.

ALOPECURUS is a genus belonging to the order Gramineæ or Grasses. The inflorescence is spike-like; the spikelets or flowers are tubular round the stalk;

the flower has a single palea, awned from the base. The genus contains many species; the only important one among them is *Alopecurus pratensis* (the meadow fox-tail grass), a valuable plant to the farmer. It is so much larger than any other British *alopecurus* as to be easily recognized. It grows commonly in meadows, where it forms rather a coarse but an abundant and early herbage, of which cattle are very fond.

Alost or **AALST** ("to the east"), a town of Flanders, 15 miles W.N.W. of Brussels, on the Dender, a navigable tributary of the Scheldt. A wall with five gates surrounds the city, which was formerly the capital of Austrian Flanders. The cathedral of St. Martin, which is unfinished or partly destroyed, is a very beautiful edifice. It contains a famous painting by Rubens, representing St. Roche pleading with Christ for a cessation of the plague; and also the mausoleum of Thierry Martens, a native of Alost who introduced printing into Belgium in 1475. An ancient town-hall, now used as a meat market, dating from 1200 A.D., a college, and hospital are the other chief buildings. There is a considerable trade in corn, hops, beer, and oil. There are also manufactories of cotton, linen, and lace, and important iron foundries. The town was captured by the French in 1667, but evacuated after the battle of Ramillies in 1706. The population in 1882 was 22,000.

ALPACA or **PACO**. The natural history of this animal is treated of under LLAMA. The wool of the alpaca is superior to English wool in length, softness, and pliability. The fleece averages from 10 to 12 lbs., while that of our sheep is seldom more than 8 lbs.; and while the staple of English wool does not exceed 6 inches in length, that of the alpaca varies from 8 to 12 inches. The lustrous appearance of the alpaca wool renders it applicable to many of the purposes for which silk is usually employed in textile fabrics; and it is found a useful substitute for Angora wool. The manufacture of plain and figured stuffs from the fleece of the alpaca was commenced at Bradford, in Yorkshire, in 1836, through the enterprise of Mr. (afterwards Sir) Titus Salt. [See BRADFORD.] The wool is chiefly employed in the manufacture of shawls, coat-linings, cloth for warm climates, umbrellas, &c. For the superior class of goods the wool is used without the admixture of anything else; but in the common kinds the warp is of cotton, or some other cheap material, and the weft only of alpaca.

Besides the use of the wool in textile fabrics, the flesh of the alpaca is both wholesome and palatable. The carcass weighs on an average about 180 lbs.

The question of naturalizing the alpaca has been taken up with great enthusiasm by a few persons; but very little progress has yet been made in convincing persons of its practicability. The alpaca inhabits the mountainous and inhospitable regions of Peru, and is remarkable for its abstemiousness. It thrives on coarse food. Those which have been brought to this country have been confined in parks and richly cultivated lands, and have been treated with too much care and tenderness. Mr. Walton asserts that they will live where our hardiest sheep would starve, and that the wildest parts of Great Britain would be best suited to their habits.

ALPES, BASSES, a department of France which once formed part of Provence, is bounded N. by the departments of Hautes Alpes and Drôme, E. by that of Alpes Maritimes, S. by the department of Var, and W. by that of Vaucluse. Its length from N.E. to S.W. is 88 miles, and its mean breadth 55 miles. The surface occupies 2685 square miles. The population in 1882 was 131,918.

The department is situated on the western slope of the Alps, branches of which cover the greater part of its surface. The temperature, except in the south, is cold and variable. In the high valleys, which are for the most part

unfruitful, the snow lies during six months in the year. In the south and south-west the valleys widen into plains, which are, generally speaking, the only good lands in the department. There are extensive forests of larch, fir, oak, pine, beech, and chestnut. On the southern slopes of the mountains in the south, myrtle, lavender, thyme, and other aromatic plants are found; here also truffles abound. There are mines of iron, copper, and coal; sulphur, granite, marble, potters' and fullers' clay are found, and there are several mineral and salt springs.

Of the whole area of the department about a twelfth is covered with forests. Corn and potatoes are grown, and fruit, especially the plum, is cultivated in great quantities. The almond, the fig, the olive, and the mulberry flourish in the warm districts of the south. Horned cattle and sheep of an improved breed are numerous, and find ample pastures on the mountains. Horses are small in size and few in number, mules being preferred in such a mountainous country. Game abounds. Great attention is paid to the nurture of silk-worms and bees. The manufactures are of small importance, but consist chiefly of coarse cloth, leather, hats, and pottery. The chief trade is in brandy, oil, leather, honey, and dried plums. The inhabitants are in general poor, and emigrate yearly to Paris and other large towns.

The rivers of the department being all mountain streams, are liable to sudden inundations, which often cause great ravages in the lower grounds. The chief is the Durance, in the basin of which most of the department lies.

Basses Alpes is divided into five arrondissements—Digne, Barcelonnette, Castellane, Forcalquier, and Sisteron. The capital of the department is Digne; the other towns are Barcelonnette, Castellane, Forcalquier, Sisteron, and Manosque.

ALPES, HAUTES, a department of France formed out of portions of Dauphiné and Provence, is bounded N. by the department of Isère, E. by Piedmont, S. by the department of Basses Alpes, and W. by that of Drôme. Its length from N.E. to S.W. is 85 miles, the mean breadth about 30 miles, its area is 2158 square miles. The population in 1882 was 121,787.

This department is covered with enormous masses of mountains, separated into groups, and surrounded by heights of less elevation, between which valleys branch out in all directions. Among the mountains are the highest points in France. Mont Olan, Mont Pelvoux-de-Vallouise, in the north of the department, Mont Viso and Mont Genève in the east, rise respectfully to heights of 13,821, 13,131, 12,575, and 11,776 above the level of the sea. The passes, by which the valleys communicate with each other, are many of them above 7000 feet high. The col of Mont Genève, by which Hannibal is said to have crossed into Italy, is 6355 feet above the sea level. There are several glaciers, one of which, the glacier of Chardon, near Berarde, is nearly 8 miles long. The south side of the mountains is bare, rocky, and desolate, while the northern sides are covered with forests up to the line where vegetation ceases. Some of the lower heights are crowned with woods, others consist of rich downs, which afford pasture to numerous flocks of sheep from the departments of Var and Bouches-du-Rhône; several of them in favourable situations are planted with vines. The department abounds in fine scenery, which attracts many pedestrian tourists. Among other places much visited is the valley of Presinière, in the neighbourhood of Mont Pelvoux-de-Vallouise, and the valleys of Queyras and Pragelas, E. of Embrun. Some of these valleys will ever be memorable as having afforded shelter to the persecuted Protestants, amongst whom laboured with great self-denial their pastor, Felix Neff. The climate is very cold in winter, which in the high valleys lasts during eight months. On the other hand, the

heat is very great during summer in the narrow valleys. Violent winds, especially from the west, are frequent and destructive, often blowing down trees and houses.

The department has 140,000 acres of forests, in which larch, fir, ash, maple, linden, and chestnut are the most common trees. Copper, lead, zinc, iron, antimony, asbestos, slate, marble, sulphur, coal, alum, and rock-crystal are found. There are hot salt and mineral springs. Game and fish are abundant. Of horses there are few; mules and asses are numerous. There are great numbers of sheep, which are of large size, and their wool is of good quality. Corn, potatoes, hemp, flax, and fruit are cultivated. The department has some cotton, linen, and cloth factories, but its chief trade is in wine, wool, cattle, and mineral products. Poverty prevails to a great extent among the inhabitants, many of whom emigrate on the approach of winter.

The chief rivers are the Drac, the Durance and its tributaries the Buëch and the Guil. The Drac rises N.E. of Mont Dauphin, flows in the direction of N.W., and enters the department of Isère, where it is joined by the Romanche and several other small rivers, and falls into the Isère below Grenoble, having run 82 miles, part of which is available for floatage. Great works have been constructed for deepening the bed of this river, in order to prevent its inundations, which were formerly very destructive. The Buëch rises in the department of Drôme, and falls into the Durance at Sisteron, having run a course of about 38 miles from N.E. to S.W., most of which is in Hautes Alpes. The Guil rises in Mont Viso, and falls into the Durance below Mont Dauphin. The department is divided into three arrondissements—viz. Briançon, and Embrun; the capital being Gap. The only other towns of importance are Briançon and Embrun.

ALPES MARITIMES, a department of France, constituted by imperial decree on 25th June, 1860, in consequence of the cession of Nice to France, together with Mentone and Roceabruna, purchased from the prince of Monaco. It is situated in the extreme south-east of France, and is included between the Mediterranean on the south-east, the departments of Var and Basses Alpes on the west, the mountains which give it its name on the north, and the kingdom of Italy on the east. Its greatest length from the north-west to the south-east is about 60 miles; its greatest breadth from Nice to Col di Tenda about 10; and its area is 1680 square miles. The population in 1882 was 226,621.

The chief rivers of the department are the Leup, the Var, and the torrent Le Pailon, at the mouth of which Nice is situated. The climate is mild and pleasant in the vicinity of the sea and in the lower valleys, although the higher mountains reach to altitudes where winter always reigns. The genial air on the coast has rendered that part a celebrated resort for invalids.

The vine and olive are much cultivated in the more favoured localities; oranges, figs, and lemons of excellent quality are produced in abundance; a considerable extent of land is devoted to tobacco; and herbs and flowers, for the preparation of essences and perfumes, are also largely grown. In many parts of the department there are noble forests. In the more elevated districts much land is used for the pasture of sheep and also of goats, of which these regions possess a highly esteemed breed. The silk-worm is reared to a considerable extent, and bees are kept in such large numbers that much honey is exported. There are quarries of white marble and some mineral springs. Among the chief branches of industry, besides those which are strictly rural, are brass founding and the making of bijouterie. The tunny, anchovy, and sardine fisheries give employment to many people on the shores of the Mediterranean, and great quantities of anchovies and sardines are

exported from Cannes. The Marseilles and Ventimille Railway, skirting the coast, connects Cannes, Antibes, Nice, and Mentone, and joins an Italian line which affords direct railway communication with Genoa.

The department is divided into three arrondissements—Nice, Grasse, and Puget-Théniers. Its chief town is Nice.

ALPHABET is the name given to the series of letters used in different countries at different times. The term is borrowed from the Greek language, in which *alpha*, *beta*, are the first two letters; Hebrew gives to the corresponding letters the names *alph*, *beth*. Thus the formation of the word is analogous to that of our familiar expression, the *A B C*.

Among the different causes which have promoted the civilization of man there is none, we might almost say, which has been so fruitful as the invention of the alphabet. Oral language itself most probably originated in an attempt to imitate by the organs of the human voice those different sounds which nature constantly presents to our ears. Written language we may with equal probability affirm to have originated in the pictures of natural objects. Several curious letters, entirely in pictures drawn on bark, sent by Indian chiefs of our own day one to another, will be found in Sir J. Lubbock's "Origin of Civilization." So also the ancient Mexican system of writing found in use under the Aztecs by Cortez, had not progressed beyond the pictorial stage. In Plate I. will be found an illustration of the precise mode in which the Mexican hieroglyphics were designed—a portion of the second page of the book or folded MS. termed the Mendoza Codex, from having formed part of the Mendoza collection. It is supposed to contain the history of Mexico from its first foundation, and, as interpreted, relates to the reign and conquests of Acenapich. The blue border at the side, which in the original is drawn in strong outline, and then washed over with an even tone of pale blue, represents a series of years, distinguished by means of the dots, counting from the first point as far as thirteen points; the compartment with five dots representing the fifth year of the reign, that with ten the tenth, and so on; the pictures of the acts of the prince being referred to each special year by means of a connecting line, or some obvious device. The additional symbols have different significations, that of the flower signifying a calamitous year, &c. The Chinese had probably a similar method of distinguishing unfortunate from prosperous years; and we find on their modern calendar, instead of the name of a prince or the year of his reign, such inscriptions as "the happy year," "the flourishing year," &c. &c.

Fig. 1 (Plate I.) is Acenapich; fig. 2, warlike instruments, signifying his preparation for war; fig. 3 is again Acenapich in a subordinate year; figs. 4, 5, 6, and 7 are the cities Quahuahque, Mezque, Cuatlanc, and Nochimilco, represented by descriptive symbols of objects whose names are either the same as, or which resemble the name of the town. Thus we might represent Glasgow by the symbols for *Glas* and *Gow*, the latter a foot-print or a man walking.

The four heads are those of the respective chiefs or kings of these cities benedicted by order of Acenapich, each distinguished by the ideographic symbol by which his name was expressed in this system of writing. The letters have been composed of somewhat, to economize space. In the original the four heads are all in front of the compartment of Acenapich, instead of above and below.

This plate is taken from Lord Kingsborough's great work, in which he has published fac-similes of all the most remarkable Mexican MSS. in existence.

The system in which the names of the towns are expressed indicates to us the next great step in the formation of an alphabet; the use of what was originally a picture to convey the sound of the name of the object

represented, or possibly a part of that sound, such as what would be its first letter with us. Thus Re, the sun, comes to stand for R in Egyptian hieroglyphics. Therefore such a character was used in four ways—(1) as meaning the object itself; (2) in a symbolical way, as the moon for a *month*; (3) in an ideal way, as a lion for *chieftainship*; (4) as a letter conveying a sound, in the manner just mentioned.

The finest coloured hieroglyphics are found on temple walls of a date certainly not less than sixteen centuries before our era, or about thirty-five centuries old. Of such a date is the wonderful record reproduced in our Plate II. It describes the triumphs of Sesostris, and the names and portrait of the great king accompany the sculptured and painted record.

The great painting from which this small portion is taken exists in the gallery of the *Speos*, or excavated temple, at Ibsamboul, in Nubia. It extends at least 50 feet in length, and represents Seytho-Bactrian ambassadors introduced to the great Sesostris (Rhamesses III.); the aim of the officer presenting the ambassadors traverses a portion of the hieroglyphic record, which describes the events connected with the picture. The first cartouche above the seated figure of Sesostris contains the prænomen of the king, which is written in partly figurative and partly phonetic signs, and has been deciphered "The king of the obedient people, the guardian son of justice and truth, approved by the sun." The next oval contains his positive name. It is surmounted by a figurative sign of the disc of the sun, and of a duck, which make, phonetically, the syllables RE-SI, son of the sun. The two figures within the oval are Ammon and Ra, or Phre, the sun; the rectangular sign beneath them is a phonetic M, used as an abridgment of the word *mai*, loved of, and the other figures signify R.M.S.S.; the whole reads (the vowels as usual omitted), "The son of the sun, loved of Ammon, Rhamesses." The initial letter of Ra, and the phonetics which follow, give R (har) Me S (c) S; and the exterior signs beyond signify, "living for ever." Our Plate of this subject is from the great work of Champollion Figéac. The columns are read vertically, the right-hand column the first. Each group is read from right to left.

Egyptian hieroglyphics show us clearly how a language originally hieroglyphic would naturally wear away until the characters lost nearly all trace of their original formation, and became mere symbols of phonetic power, first perhaps as syllables, afterwards as simple letters. We shall also deal with this subject more fully under HIEROGLYPHICS.

The Hebrew alphabet again affords evidence of the same nature, inasmuch as the names of the letters are also the names of material objects, and the symbols too, when closely examined, are, some at least, rough pictures of these objects. But when we speak of the symbols we must recollect that the characters now current under the name of the Hebrew alphabet (p. 206, No. 1, column 1) are of later date than those called Phœnician and Samaritan, in columns 2, 3, 4, 5. The first two are taken from Boeckh's "Inscriptions," pp. 523, 527, and from the coins given by Mionnet; the Samaritan characters are copied solely from Mionnet. But we may go even higher, for the Greek alphabet and the Etruscan (which, notwithstanding its independent name, is a mere offshoot from the Greek) generally present a still more accurate picture of the original letters; as might be expected from the two corroborations, that the inscriptions in the Greek tongue are of an older date than any Phœnician inscriptions or Samaritan coins, and according to the express testimony of Herodotus (v. 58), founded on personal examination, the Ionians received their characters from the Phœnicians, and actually called them Phœnician. Now the first letter in these alphabets, *aleph*, it is well known, means an ox; indeed, the terms *αλεφας*, *elephas*, *elephant*, of the Greek,

Latin, and English languages, seem to be derived from this Hebrew name. If in Syria the name *aleph* was extended to the elephant—just as the Greeks applied their term *crocodile*, properly a *lizard*, to the monster of the Nile—when the word came to the western nations in connection with the elephant, the original sense would be readily lost in the secondary. The Romans, too, called the same animal *bos Lucas*, the *Lucanian ox*. We have already stated that the most simple mode of representing an ox would be by a picture of its head and horns, and such is seen in the Phœnician character in column 8.

Again the Hebrew name for the letter *m* was *mem*, and this also was the name for water. Now a very ordinary symbol for water is a zigzag line, which is no doubt intended to imitate undulation or rippling. Now, if we turn to the oldest Greek character for this letter, we find a mere wave, the initial or concluding stroke of which becoming by a kind of flourish longer than the others, leads to the so-called Etruscan and Greek forms in columns 13, 14, 15. This long descending stroke takes a bend in the Samaritan and Hebrew characters towards the left, as was not unnatural in a language where the words are written in that direction. By a comparison of the Hebrew *gimel*, *nun*, *ayin*, and *pe*, and perhaps *caph*, with the corresponding letters in the other alphabets, the reader will perhaps be induced to ascribe the bottom strokes, which in these letters also run to the left, to the same accidental origin. This supposition is strongly confirmed by the fact that the *caph*, *nun*, *pe*, and *tsadi*, when they are the final letters of a word, omit this appendage, and in its place have the perpendicular stroke merely continued in the same direction downwards a little beyond its usual length.

Our last example shall be from *ayin*, which is at once the name of a letter and the word which signifies an eye. The eye happens, moreover, to be a hieroglyphic character of the Egyptians, and therefore we cannot be surprised to find it among the Hebrew symbols. Champollion says the Egyptian picture of an eye in the hieroglyphics was actually used at times for an *o*, exactly as *ayin* by the Hebrews. Such a character is also found in our Greek series of alphabets, No. II., column 16. The latest conceptions as to the possible mode of derivation of the Hebrew alphabet from Egyptian hieroglyphics will be found in a plate on that subject under HIEROGLYPHICS.

We will now consider the distribution of articulate sounds among the vowels, liquids, and consonants. The vowel sounds are usually placed in the order *a, e, i, o, u*, such being their succession in the various alphabets of Europe and Western Asia; but if we wish to place them in that order which marks their relation to one another, we should write *i, e, a, o, u*, or in the opposite order, *u, o, a, e, i*. We are here considering the natural sounds of the vowels, as used by nearly all nations save ourselves, namely—*i* like *ee*, *e* like *ay*, *a* as in *fither*, *o* as in *bone*, *u* as *oo* in *food*. The liquids, again, should be written in the order *r, l, n, m*, beginning from the throat and advancing along the palate and teeth to the lips; or in the reverse order.

The other letters have often been divided according to their organs: first, the guttural and palatals, *g* (as before *a*), *k* (with *e, q*); *gh, ch* (as in the Scotch *loch*); *h*, with perhaps *ng, y*, and *wh*. Secondly, dentals, *d, t*; *dh* (as *th* in *this*), *th* (as in *thing*); *z, s*; *zh* (like *ch* in *church*), *sh*; *j* (as in English), *j* (as in French). Thirdly, labials, *b, p*; *v, f*, and *w*. Perhaps the last four of these which we have included among the dentals partake in an equal degree of the palatal character. In the above enumeration of the consonants we have placed first in their respective series those commonly called the middle (or medial) letters, *g, d, h*; then the tenuis, or more delicate letters, *k, t, p*; and

then the aspirates; but as each class presents two forms of the aspirate readily distinguished by the ear, and as these pairs of aspirates stand in the same relation to one another as the medial and tenuis, we have throughout placed what we may perhaps call the middle aspirate before its delicate relative, viz. *gh* before *ch* or *χ*; *dh* before *th*; *v* before *f*.

Having endeavoured to arrange the letters of the alphabet upon some principle, we cannot pass over in silence the apparent confusion in the alphabets we have been speaking of—the Hebrew and Greek. That the order in the latter is the same as that in the former can scarcely admit of a question. For though the *rau* of the Hebrew has no corresponding character in the later Greek alphabet, it is yet well known that it once had such a correlative in the *digamma*, at least in power; and that the *digamma* was actually lost from the sixth place is proved from the gap at that point in the numerical use of the Greek alphabet (the letters of which formed the ancient Greek numerals), and the clumsy contrivance of filling it up by the letter *z*. The position of the letter *f* in the Roman alphabet is a proof in confirmation. The *tsadi* of the Hebrews can never have had a place in the Greek alphabet, but the following letter *koppa* most assuredly had, as is proved both by the existence of that letter in many of the older Greek inscriptions and the coins of Croton, and no less decidedly by the insertion again of a numerical substitute, which even retained the name of *koppa*. It may be observed too that the Latin *q*, of the same power and form, corresponds also in position; and the close connection between *koppa* and *j* is further confirmed by the fact that, as *q* is generally used solely before *u*, so *koppa* is rarely used before *u*, as in the coins of Cos, Corinth, and Syracuse. The *shin* and *sin* of the Hebrew have in their own alphabet not merely an identity of form, except in the diacritic points, but bear also the same numerical value, so that they must be considered as one in their origin. At *tau* the Hebrew series terminates, while the Greek adds first a *u*, then a *φ*, a *χ*, a *ψ*, and an *ω*. That some of these did not belong to the early Greek alphabet is proved historically. The *ω* appears rarely before the year 403 B.C.; *ψ* was represented by *Φ Σ*, and *υ* or *τ* appears to be only a variety of the *ayin*, to which it bears a strong resemblance in form. The letters *o* and *u*, moreover, in all languages, are so closely related in power that the one might almost supply the place of the other, as is actually the case in the Etruscan, which had a *u*, but no *o*. It is not, therefore, a very bold thing to assert that the early Greek alphabet terminated at the same point as the Hebrew.

The principle which governed the first arrangement of the Hebrew or old Greek alphabet is still to seek. Though we cannot satisfactorily account for the whole order throughout the twenty-two letters, there are certainly traces of some regularity in the arrangement. We find first the simplest of the vowel sounds followed by the three medials, *β, γ, δ*; then another vowel, followed, with some irregularity indeed, by aspirates corresponding in order to the above consonants, *rau, cheth, thuth*, no bad representatives of *φ, χ, θ*. Then again we have a vowel *u*, followed soon after by three consonants related to each other, *λ, μ, ν*. Soon after we find a fourth vowel *o*, and after it, with a little interruption it must be allowed, *pi, koppa, tau*. It cannot well be a mere accident that the several classes of labials, palatals, and dentals occur so nearly together in the different parts of the series, and always in the same order.

The accompanying illustrations require a few remarks in addition to what has been already said. No. I. contains alphabets running from the right to the left, a practice which seems to have been earlier than that which

left; another, which soon prevailed over the rest, turned towards the right; and a third, in which the direction of the lines alternated, as in the course of a plough, from which idea inscriptions of this kind are said to be written

Βουεργεφνδον, or *ox-turning-wise*. This last method must have been much more convenient than our present broad sheet of letter-press, in which the eye, on arriving at the end of a line, requires a nice perception of a straight line

No. III.—GREEK ALPHABETS—continued.

No. IV.—ROMAN LETTERS.

Alter to Eusebius, 38.		Ptolemaean Epiaph, 170.		After 403 B.C.		Various.			Codex Alexandrinus.		Early Printing.	
23	23	24	24	25	25	26	27	28	29	30	31	31
Α		Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
Β		Β							Β	Β	Β	Β
Γ		Λ	Γ						Γ	Γ	Γ	Γ
Δ		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Ε		Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε
		Ι				Ζ			Ζ	Ζ	Ζ	Ζ
		Η	Η	Η	Η	Η	Η	Η	Η	Η	Η	Η
Θ		Θ	Θ						Θ	Θ	Θ	Θ
Ι		Ι	Ι						Ι	Ι	Ι	Ι
Κ		Κ	Κ			Κ			Κ	Κ	Κ	Κ
Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ
Μ		Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ
Ν		Ν	Ν						Ν	Ν	Ν	Ν
Ξ		Ξ	Ξ	Ξ	Ξ	Ξ	Ξ	Ξ	Ξ	Ξ	Ξ	Ξ
Ο		Ο	Ο						Ο	Ο	Ο	Ο
Π		Π	Π	Π	Π	Π	Π	Π	Π	Π	Π	Π
						Φ						
Ρ	Ρ	Ρ	Ρ			Ρ			Ρ	Ρ	Ρ	Ρ
Σ		Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ
Τ		Τ	Τ						Τ	Τ	Τ	Τ
Υ		Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ
Φ		Φ	Φ			Φ			Φ	Φ	Φ	Φ
Χ		Χ	Χ						Χ	Χ	Χ	Χ
		Ψ	Ψ						Ψ	Ψ	Ψ	Ψ
				Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω

Racemian inscription, 156 B.C.		27 A.D.		68 or 69 A.D.		Mosaic M.S. of Virgil, 419, or 431 A.D.		Longobardic, from Asti, p. 54.		Saxon, from Asti, p. 98.	
1	1	2	3	4	5	6	7	8	8	8	8
A	A	AA	A	λ	λ	λ	α	α			
B	B	BB	B	B	B	l	b	b			
C	C	C	C	C	C	c	c	c			
D	D	DD	D	D	D	d	d	d			
E	E	EE	E	E	E	e	e	e			
F	F	FF	F	F	F	f	f	f			
G	G	GG	G	G	G	g	g	g			
H	H	HH	H	H	H	h	h	h			
I	I	II	I	I	I	i	i	i			
K			K		K		k	k			
L	L	LL	L	L	L	l	l	l			
M	M	MM	M	M	M	m	m	m			
N	N	NN	N	N	N	n	n	n			
O	O	OO	O	O	O	o	o	o			
P	P	PP	P	P	P	p	p	p			
Q	Q	Q	Q	Q	Q	q	q	q			
R	R	RR	R	R	R	r	r	r			
S	S	SS	S	S	S	s	s	s			
T	T	TT	T	T	T	t	t	t			
V	V	VV	V	V	V	v	v	v			
X	X	XX	X	X	X	x	x	x			
Y			Y	Y	Y	y	y	y			
Z		ZZ	Z			z	z	z			

Additional Saxon Letters, *th*; *p* *w*.

to hit the new commencing point. The second and third series give numerous specimens of the Greek alphabet, which are taken chiefly from Boeckh's great work published at Berlin, and the numbers written after the titles at the head of each column refer to the order of the inscription in that work.

The several inscriptions which have furnished these Greek alphabets exist in the following forms:—

No. 13, in two flutings of a Doric column brought from the island of Melos, now in the Naniin Museum; but this inscription is open to suspicion.—No. 14, on a bronze tablet found in 1783 in Italy, near Petilia, north of Policastro. It is in the Museum at Naples.—No. 15, on a vase discovered in a sepulchre near Corinth.—No. 16, on a bronze tablet dug up at Olympia, and brought away by Gell in 1863.—No. 17, on a bronze helmet found in 1817 in the ruins of Olympia.—Nos. 18, 19, found at Delphi.—No. 20, on a small votive helmet found near Olympia.—No. 21 is from Mazzechi's folio on the Heracleian tablet.—Nos. 22, 23, part of a hymn to Bacchus inscribed on an altar, which contains also a representation of a procession in honour of the god, in the Pembroke Museum at Wilton.—No. 24, from an epitaph in elegiac verse on those who fell in the first battle before Plataea, B.C. 432. (Thucydides, i. 62.) It was found in the plain of the Academy near Athens, and is now in the British Museum.—No. 25. The alphabet here given is that which came generally into use at Athens after the archonship of Euclides, 403 B.C. Specimens may be seen in the Elgin Marbles of the British Museum.—The "Codex Alexandrinus," No. 29, is in the British Museum.

Of the Roman alphabets given in No. IV, the first is from the facsimile of the Bactrian inscription given by Dübner in the seventh volume of his "Livy," the date of which is fixed at 186 B.C., by the names of the consuls given in the decree. This inscription is in the Museum at Vienna. The second and third columns are from an inscription given by Maffei, in his "Istoria Diplomatica," p. 38; and here the date is fixed to the year 27 A.D., in the reign of Tiberius, by the names of the consuls M. Crassus Frugi and L. Columinius Piso. Column 4 is from the same work of Maffei, p. 31, and belongs to the year 68 or 69, as is determined by the mention of the Emperor Galba. Both these inscriptions are of very coarse execution. Columns 5 and 6 are from the Medicean MS. of Virgil, preserved at Florence. The Lombard and Saxon alphabets (7 and 8) are from Astle's "Origin of Writing."

ALPHEUS, one of the chief rivers of Peloponnesus (Morea), which rises in Arcadia, and flows through Elis, past Olympia, to the Ionian Sea, receiving in its course the rivers Helisson, Ladon, Erymanthus, Cladus, as they were called by the Greeks, and numerous smaller streams. It is now called Rouphea up to its junction with the Ladon, and above that the river of Karenta. It drains a large mountain district, bounded by Mount Erymanthus on the north, the central ridge of Arcadia on the east, and the mountains of Laconia and Messenia on the south. Not far from its source, and near a place called Synbela (the Meeting of the Waters), the Alpheus (says Pausanias, vi. 14, 34) is joined by a stream, and sinks under ground; it is again 5 stadia from Asea, close to the fountain of the Laretæ. The two rivers then mix their waters, and after flowing 20 stadia are again swallowed up, and appear—the Euerates in Laconia, the Alpheus at Pegæ (the Springs), in the territory of Megalopolis, and in Arcadia. These subterranean descents of streams are not uncommon in the Arcadian rivers, and are called by the vulgar Greeks *Katastrophæ*. Hence perhaps arose the mythical story in ancient times of Alpheus, the river-god, carrying the nymph Arethusa, of whom he had become

enamoured, under the sea to the island of Ortygia, where she was changed by Artemis (Diana) into a fountain.

The Olympic games were celebrated on the banks of this river.

ALPS, the name of a large mountain system in southern Europe, which is generally supposed to derive this appellation from a Celtic word, *alb* or *alp*, signifying "white." The geographical features will be noticed first, and then the geological formation.

1. *Geographical Description*.—The Alpine system, in its full geographical extent, may be considered as connected with the chain of mountains that runs through the Italian peninsula; and the point of its junction with the Apennines cannot therefore be accurately determined. Some fix the commencement of the Alps at the depression of the Valley of Savona, and others at Capo delle Melle on the Gulf of Genoa. Assuming it to commence at this cape, its course is first W., then N.N.W., next N., then N.N.E., and gradually it bends round towards the head of the Gulf of Venice; so that the chain of the Alps generally presents a concave line towards Italy. The minor chains, branches, and offsets are very numerous; but these are noticed under the heads of the countries to which they belong. The main line of the Alps here described, commencing at the Gulf of Genoa, and ending at the Great Glockner, eastward of the Tyrol, is grouped into portions known by six different names, the *Maritime*, the *Cottian*, the *Graian*, the *Pennine*, the *Helvetic*, and the *Rhodian* Alps. These collectively, with the branch from the Glockner towards Venice, form an unbroken range which cannot be avoided by any detour in passing out of Italy to France, Switzerland, Tyrol, or Germany.

The geographical position of the main mass of the Alps is remarkable as lying about midway between the equator and the north pole. The following positions and elevations, between Monte Viso and the Grand Glockner, are all included within this mass:—

Names.	Lat.	Lon.	Height in Eng. ft.
Monte Viso,	44° 40'	7° 5'	13,599
Mont Genève,	44° 48'	6° 40'	11,781
Mont Cenis,	45° 8'	6° 36'	11,457
Mont Iséran,	45° 30'	7° 16'	13,267
Mont Blanc,	45° 50'	6° 51'	15,714
Mont Cervin,	45° 58'	7° 40'	14,835
Monte Rosa,	45° 56'	7° 52'	15,151
Mont Gothard,	46° 34'	8° 33'	12,600
Gallenstock,	46° 37'	8° 24'	12,477
Vogel Berg, or Piz Valrhœn,	46° 29'	9° 2'	10,866
Ortler Spitz,	46° 28'	10° 32'	12,818
Gelatsch,	46° 48'	10° 50'	12,276
Gross Glockner,	47° 7'	12° 43'	12,431

The great valleys of the Alps, such as those of the Rhone, the Inn, and the Drave, lie nearly in the direction of the main chain. The transverse valleys are much shorter, and on the Italian side often end in lakes, such as Lakes Maggiore, Como, &c. The slope of the Alps on the Italian side is in almost every part steeper than on the opposite; so that the lakes and valleys on the northern side are much higher than those towards Italy. The width of the Alpine chain varies from a few miles to 150 miles, and can in no part be estimated with much exactness.

The *Maritime Alps* extend from the Gulf of Genoa to Monte Viso, a distance of about 100 miles. The only carriage-road across them is by the Col de Tenda, at an elevation of 5887 feet, formed by Napoleon. There are three or four smaller roads practicable for mules. From this range flow the rivers Gesso, Stura, Maira, Vraita, Po,

Roya, Var, and Ubaye. Monte Viso, which terminates this division, is one of the most splendid mountains in the chain; wherever the line of the Alps can be seen from the basin of the Po, this fine summit is distinguished.

The Cottian Alps extend from Monte Viso to Mont Cenis, a distance of about 60 miles. This division is not very remarkable; no celebrated mountain occurs in it, and the rivers are small. The carriage road of Mont Genève, formed by Napoleon, is the chief pass, leading from the valley of the Durance in France to Susa in Piedmont.

The Graian Alps extend from Mont Cenis to the Col de la Seigne, about 60 miles. This group includes Mont Cenis, one of the best known of the Alpine passes. This pass was only a mule road till 1803, when Napoleon commenced a magnificent carriage road, which crosses the chain at a height of 6773 feet. The pass of the Little St. Bernard, by which Hannibal entered Italy, crosses the Graian Alps to the Val d'Aosta. Two or three other passes cross the range, and some small rivers spring from it.

The Pennine Alps, extending about 60 miles from Mont Blanc to the Simplon, include Mont Blanc, Monte Rosa, and the Matterhorn or Mont Cervin, the three loftiest peaks in Europe. On each side of Mont Blanc are cols or passes of the mountains, usually traversed by pedestrians in their tours in the Mont Blanc district. There are three larger passes, however, viz. the Great St. Bernard, with a hospice at the height of 7963 feet above the level of the sea; the Cervin, at a height of 11,096 feet; and the Simplon, the pass of which, at an altitude of 6578 feet, is one of Napoleon's most magnificent works.

The Helvetic Alps, extending from the Simplon to Mont St. Gothard, a distance of about 60 miles, are crossed by the pass of St. Gothard, which has a summit level 6890 feet high. The Rhine, the Rhone, the Reuss, and many other rivers have their rise in this chain.

The Rhetian Alps, which extend about 80 miles east from St. Gothard, have many good passes for travellers—the St. Bernardin, at an elevation of 6700 feet; the Splügen; the Maloja, 8130 feet; the Stelvio, 9174 feet; and the Brenner, 4800 feet—all of which connect Tyrol and the Grisons on the north with Lombardy on the south.

The Noric, Julian, and Carnic Alps bend round from the Tyrol towards the head of the Gulf of Venice, and are crossed by the lines of railway from Vienna to Salzburg, and from Vienna to Trieste and Venice.

Owing to the great elevation of the mountains, we find the summits of many of them perpetually covered with snow. The point where the snow-line commences must necessarily vary in summer and winter, but even during the hottest summer snow is always found at an elevation varying according to circumstances from 9000 to 9500 feet. For an account of the rivers of ice which flow through many of the valleys we refer to GLACIERS; and to AVALANCHES for some consideration of the terrible effects of sudden descents of masses of snow from the mountains.

Geological Formation.—The Alps exhibit numerous valleys running both parallel and transverse to them, as if there had been cracks and fissures produced by forces acting from beneath. It is now the opinion of geologists (contrary to a former supposition) that the Alps were elevated at different and widely distant periods; for some parts exhibit strata broken and tilted up at various angles, with other strata resting on the fractured edges of the former; while the second group, again, at another part, is seen broken and disordered, and a third lying quietly on it.

The central ranges of the Alps are in a great measure, though not altogether, composed of gneiss, mica slate, talcose slate, and similar rocky formations. Gneiss may be considered as very abundant; it constitutes the mass of Mont Blanc, and of several other lofty mountains. Mica slate is also very abundant, frequently passing by insensible

gradations into talcose slate, and thus offering instructive examples of the mode in which mica and talc are substituted for each other.

In the eastern Alps are found strata of the transition series, the lowest portion of the fossiliferous rocks, or those which contain the remains of animals and vegetables. Next in the order of superposition we find sandstones, slates, and conglomerates, often of a red or variegated colour. These rocks have a considerable range through the Alps; and, though by no means constantly present, occur when they can be observed, above one or other of those previously mentioned, and beneath the great mass of calcareous rocks to be next noticed. Some of these beds have been formed by the wearing away of older rocks. Next occurs an enormous calcareous layer, interspersed with schists and sandstones. In some of the lower beds of this mass many fossil plants are met with. In many parts of this calcareous system dolomite (a compound of carbonate of lime and carbonate of magnesia, more or less crystalline) constitutes masses of considerable extent and thickness, the stratification often becoming indistinct, and even lost, when the rock becomes highly crystalline.

Above the calcareous mass of the Eastern Alps a series of beds has been discovered, consisting principally of micaceous sandstones and blue marls; the latter alternate with limestones and calcareous grits. The strata in question are well seen in the valley Gossau, amid the Alps, S.W. from Salzburg, and have hence received the name of Gossau beds. In these beds nearly 100 species of organic remains have been found. Next in the order of superposition we find strata of great collective thickness, known under the names of Nagelfluh, or Molasse, the former being conglomerates, and the latter sandstones. The various beds are entirely composed of fragments of Alpine rocks, ground down by attrition, and varying in size from a man's head to grains of sand. This variation in size shows that the waters which have transported the fragments into their present relative situations must have possessed different degrees of velocity, and that this velocity must often have been considerable, as the fragments moved are large. Beds of lignites are here and there interstratified with the molasse and nagelfluh, and are worked in various places for economical purposes. In them, or in the strata associated with them, the remains of the mastodon, rhinoceros, paleotherium, and anthracotherium have been found.

Such are the stratified rocks which compose the mass of the Alps. Although these various strata may thus be described as forming zones parallel to the central axis, patches of them are often thrust up, or rolled over, out of their general lines of bearing, in consequence of the various disturbances to which these mountains have been subjected. The igneous rocks comprise granite, both in masses and in veins traversing gneiss; porphyry, which in Tyrol has much disturbed the stratified rocks; serpentine, and other varieties.

Scattered on either side of the Alps, and down the principal valleys, are huge blocks of rock, evidently detached from the great central range, and frequently accumulated in considerable numbers. For an account of these see ERIATIC BLOCKS, GLACIERS.

Botany.—The vegetation of the Alps differs in many respects from that of the plains beneath. At the foot of the mountains, for instance, are rich vineyards, and wine is one of the staple products of the country; the forests consist of most of the common European trees. But at the low elevation of 1950 feet the vine is no longer capable of existing; at 1000 feet higher sweet chestnuts disappear; 1000 feet further and the oak is unable to maintain itself; at the elevation of 4680 feet, less than one-third of the height of Mont Blanc, the birch, as well as almost every other deciduous tree, ceases, the spruce fir alone attains the

height of 5900 feet, after which the growth of all trees is arrested, not by perpetual snow, which does not occur for more than 3000 feet higher, but by the peculiar state of the soil and air. At the line where the spruce fir disappears the mountains are ornamented by the *Rhododendron ferrugineum*, which covers immense tracks, like our English heath and furze; but even this hardy mountaineer cannot ascend beyond 7800 feet.

Railways.—The great Alpine range is crossed and pierced by several lines of railway. The first opened for traffic was over the Brenner Pass, in August, 1867. The ascent commences at Bolzano, the Brenner Road proper terminating at Innsbruck. The difficulties of its construction were serious. No less than 16,000 men were employed, of whom 1200 perished.

In 1871 a far bolder and more convenient enterprise was completed by the successful opening of the Mont Cenis tunnel, after thirteen years' laborious work. The cutting, however, is not through Mont Cenis, but through the neighbouring Mont Vallon—from Modane, in France, to Bardonnèche, in the valley of the Dora, Piedmont.

Before the Mont Cenis tunnel was quite finished, an opposition line, promoted largely by German enterprise, was commenced through Mount St. Gothard. The boring was begun in January, 1871, and though $9\frac{1}{2}$ miles in length—2 miles longer than the Mont Cenis—was finished in March, 1880, having taken little more than nine years as compared with the thirteen occupied in constructing the first tunnel. The approaches were completed and the whole tunnel opened for traffic in 1882. See TUNNEL.

ALPUJAR RAS, a mountainous region of Spain, in the province of Andalusia, lying between the Mediterranean and the Sierra Nevada, and extending from Motril to Almería. The name is a corruption of an Arabic word meaning grass, and the district chiefly consists of valleys, which are amongst the most beautiful and productive in Spain. Fruits of all kinds are abundant. Some of the villages are situated at a height of 5000 feet above the level of the sea. The Moorish descent of the inhabitants is plainly traceable.

AL RESFORD, NEW, a market town in Hampshire, and a station on the South-western Railway, $57\frac{1}{2}$ miles from London and about 7 from Winchester. It is situated on the Itchen, which has its source in Alresford Pond—a piece of water 32 acres in extent, where trout are found in abundance. The place is the centre of a large agricultural district, and possesses a market house, banks, and two breweries. There are a church, an Independent chapel, some schools, a union, and an orphan home for the children of soldiers and sailors. Alresford sent a member to Parliament in the reign of Edward I., but has long since ceased to be represented. The population of the parish in 1881 was 1600. *Old Alresford*, divided from the above by a stream, has a separate church, where *Admiral Lord Rodney*, who died in 1792, is buried.

ALSACE-LORRAINE (German, *Elsass-Lothringen*), the name of a former province of France, the greater part of which was divided after the Revolution into the departments of Haut Rhin and Bas Rhin, and incorporated after the war of 1870–71 with the German empire. The tract of country ceded to Germany comprised also a large part of the department of the Moselle (formerly *Lothrine*), and forms a "Reichsland," or Imperial Land, under the immediate government of the chancery of the German empire, who for administrative purposes appoints a local governor-general, with the title of *Statthalter* of the Reichsland. Under the latter are three distinct governors, bearing the title of *Bezirkspräsidenten*, and filling to a great extent the position of the former French prefects, being also, like them, stationed at Strasbourg, Colmar, and Metz. Under the statistical ministry of three departments,

with a responsible secretary of state; and the council of state comprises the general commanding the troops in the province, the three district governors, and seven other members appointed by the emperor. For the administration of local affairs there is a provincial committee consisting of fifty-eight members. The entire Reichsland has an area of 5580 square miles, with a population in 1882 of 1,580,000, and is divided administratively into three *bezirke*, or districts, called Ober-Elsass, Nieder-Elsass, and Lothringen. These are subdivided, the first into seven and the other two each into eight *kreise*, or circles. The Reichsland is bounded on the N. by the Rhine Palatinate, E. by the Rhine, W. by the Vosges Mountains, and S. by Switzerland. In size it is about the same as Baden, but has a larger population; and Baden, it may be observed, stands fifth, as regards both population and size, in the list of twenty-five states comprised within the German empire.

The west of the district is occupied by the rugged woody highlands which form the eastern face of the Vosges Mountains, which are, towards the south, remarkable for the number of dome-shaped summits occurring in the main ridge, called from their form *Ballons*. The mountain sides are diversified with precipitous rocks and picturesque valleys watered by small streams, most of which flow ultimately into the Rhine. The mountains, which have a mean height of about 2300 feet, but rise at points to 4777 feet, are composed of sandstone, limestone, and marl. From the eastern foot of the Vosges a rich tract, forming about two-fifths of the whole surface of the district, extends with gentle slope to the bed of the Rhine.

Hydrography, &c.—The district belongs chiefly to the basin of the Rhine—studded in this part of its course with islands which form a serious obstruction to navigation. The river has here a considerable breadth, an average depth of 10 to 12 feet, and yields abundance of trout, perch, salmon, carp, sturgeons, and eels. The Ill, which rises near the Swiss frontier, and flows northwards parallel to the Rhine and a few miles west of it, receiving the mountain streams of the Vosges, has a total length of 100 miles, and is navigable through about half its course. It joins the Rhine 5 miles below Strasbourg. The Zorn, the Moder, the Surbach, the Seltzbach, and the Lauter, all flow from the eastern face of the Vosges into the Rhine. Of these the Moder alone is navigable, and for only 2 miles. The others are used for floating timber down from the mountains. The Sarre, a feeder of the Moselle, which is itself a tributary of the Rhine, flows within the district for about 20 miles, 10 of which are navigable. The Lauch and the Fecht, which join the Ill, are both used for floating timber, as is also the Ill in its upper part. The Larque, which rises in the Jura, has been made a feeder of the Rhine and Rhine Canal. The south-west of the district belongs to the basin of the Rhone, and is drained by the Halle, the St. Nicholas, and the Savoureuse, which fall into the Doubs. None of these rivers are navigable. There are several canals, the most important being the above-named Rhone and Rhine Canal. It enters Alsace near the junction of the little rivers Halle and St. Nicholas, and runs partly along the valley of the Ill to the basin near Mulhausen, and continuing a northward course opens into the Ill just above Strasbourg. The Bruche Canal commences near the junction of the Moselle with the Bruche, and follows the valley of the Bruche River to its junction with the Ill. Including the Rhine, which is navigable along the east boundary of the district, the internal navigation extends over a length of about 800 miles. The district is traversed by the Strasbourg-Basel and the Paris-Strasbourg railways.

Among the remarkable valleys that lie between the offshoots of the Vosges must be named the Katzenthal, in which several mines are worked; the Jagerthal, studded

with iron furnaces and forges; the valley of Niederbronn, famous for its mineral waters; the Barenthal, for its numerous factories; the Kronthal, for its vast quarries; and the Klingenthal and the Bruche, which abound in picturesque sites.

Climate.—The climate of the district is on the whole temperate, but the winters, owing to the snow lying so long on the Vosges, are long; the heats of summer, which succeed the winter almost immediately (for the springs are very short), are often disagreeably varied by sudden chills; the autumn is invariably long and fine. The prevailing winds blow from the south and north-east. Cretinism and goitre prevail in some parts, though not to such an extent as formerly.

Soil and Products.—The soil of the mountains is rocky, and in a great degree barren; that of the immediate banks of the Rhine is marshy, but the flat which occupies the intervening space is rich and highly cultivated. The district produces corn of all kinds in quantity more than enough for home consumption. Wheat is the chief grain crop; spelt-wheat is extensively cultivated in the north; rye also is an important crop; oats are but little grown, except on the high lands. Madder and tobacco are objects of careful cultivation in the valley of the Rhine, and excellent hemp is grown. From cabbages, which are extensively cultivated and grow to an enormous size, a great quantity of *choucroute* or sauer-kraut is made for sale in other parts of Germany. Among other productions must be named oleaginous seeds, potatoes, beetroot, onions, beans, hops, and gentian. Great numbers of large plums for preserving are grown; also cherries, from which excellent kirschwasser is made. Large quantities of wine are also produced, and a considerable portion of the vintage is exported. There is a great breadth of meadow land in the department. Horses and cows are very numerous, and of good breed; both oxen and horses are employed in agriculture. The number of sheep is small. Swine are reared in great numbers, and also geese, the livers of which are used in making the famous Strassburg *patés de foie gras*. Among the wild animals are the wolf, fox, boar, cat, deer, eagle, and falcon. Even amid the mountains there are some very productive valleys, and here cultivation is carried on with great care. The hills generally are richly wooded, chiefly with fir, beech, and oak; and the abundant supplies of timber, floated down the various streams from the Vosges, furnish fuel for the various manufactures. Gold, silver, copper, and lead are found; a great number of iron mines are worked; also mines of antimony, coal, and asphalt; rock-crystal, marble, porphyry, granite, building stone, gypsum, potter's clay, marl, ochre, &c., are quarried. There are mineral springs in several localities.

Manufactures and Resources.—The industrial products are of the most varied description. The district was one of the most active seats of the cotton manufacture in France, and upwards of 100,000 persons are still engaged in it. The excellence of the printed silks, cottons, and calicoes of Mulhausen is well known. The other articles include shawls, handkerchiefs, hosiery, fine woollen cloths, flaxen and hempen fabrics, ornamental paper, straw hats, chemical products, soap, leather of all kinds, ironmongery, iron wire, clock and watch movements, pottery, &c. There are also numerous thread and woollen yarn factories, dye-houses, sugar refineries, establishments for distilling spirits from pressed grapes, corn, cherries, gentian, potatoes, and carrots; iron furnaces and forges; paper mills, breweries, tanneries, potteries, and glassworks.

The chief articles of commerce are the leading industrial products, together with wine, corn, spirits, kirschwasser, steel, bar iron, iron castings, watch and clock movements, fruit trees, cattle, &c.

History.—From a very early period and for many ages Alsace-Lorraine has been a disputed territory, and has suffered in the contentions of rival races. It formed part of ancient Gaul, and with the general territory known under that name passed to the Romans, by whom it was held for nearly 500 years. Upon the rise of the Frankish monarchy, under Chlodwig (or Clovis), it fell into his hands; and after Western Europe was united under Karl the Great (Charlemagne), it was included in the empire of that prince. About the middle of the tenth century Alsace-Lorraine passed to the possession of Otto I., emperor of Germany, and remained German until 1618. The Thirty Years' War, which then concluded, so weakened the power of the German emperor that a large portion of Alsace-Lorraine fell an easy prey to the French, to whom it was ceded by the treaty of Münster. In 1680, at the end of another war, further portions of this disputed territory fell to France, under the same circumstances as before—the powerlessness of Germany to resist. In 1681 the French troops, under Louvois, seized Strasburg, aided by the treachery of the bishops and other great men of the city, and this ill-gotten gain was confirmed to France in 1684 by the treaty of Ratisbon. By the treaty of Ryswick, in 1697, another considerable portion was ceded to France, and some remaining territories of small extent were acquired by the French after the revolution of 1789. Throughout all these changes, however, the preponderance of population remained Teutonic; and the invariable use of German as their native tongue, seemed to identify the inhabitants with the race to the east rather than with that to the west of the R. The people, however, came in time to consider themselves French, and evinced no longing for re-annexation to Germany.

In the war of 1870-71 it was on Alsatian territory that Frenchman and German first met in deadly strife. Here the earliest and most sanguinary battles of the campaign were fought; and the people, notwithstanding their German origin, showed a very strong feeling against the invaders, and in no part of France was the enemy resisted with greater stubbornness. Considering its tremendous results, the war was very brief, but the collapse of French power would have been much more ignominiously sudden had it not been for the resistance offered by the great fortresses of Alsace-Lorraine—Metz, Strasburg, Thionville, Schlestadt, Marsal, Neu Breisach, Phalsbourg, and the gallant little stronghold of Bitsche, the only one of the series which remained unconquered. When the preliminaries of peace came to be discussed at Versailles, in February, 1871, the cession of Alsace, together with what was known as German Lorraine, including Metz, was one of the conditions demanded as indispensable. The whole department of the Bas Rhin, the greater portion of the Moselle, the Meurthe, and the Haut Rhin, and a small corner of the Vosges, were comprised in the concession, which may be more briefly described as the whole of Alsace (minus Belfort) and a fifth of Lorraine. To decide what should be their future nationality, the inhabitants were allowed until 30th September, 1872, on which day no less than 15,000, who had elected to remain French, sorrowfully took their departure. The German system of compulsory education was introduced directly after the annexation; and in 1874 universal military service, and all other features of the German constitution, were fully established. Whatever may be thought of the policy of taking over a considerable population averse to German rule, the strategic advantages gained by Germany in the event of any future war with France are immense and indisputable.

ALSEN, a small island in the Baltic formerly belonging to Denmark. It lies in the Little Belt, off the coast of Schleswig, is about 20 miles long and from 5 to 12 broad, and is separated from the mainland by a deep but narrow

channel. The soil is very fertile, and produces grain, fruit — for which it is celebrated — potatoes, rape, and flax. The island is one of the most pleasant in the Baltic, containing some fine woods and small fresh-water lakes well stocked with fish. Sonderborg, the chief town, is a place of some antiquity. It has a good harbour and considerable trade, and about 5500 inhabitants. During the Schleswig-Holstein war Alsen was a place of considerable military importance. It was taken by the Austrians and Prussians in June, 1864, and at the treaty of peace was ceded, with the duchy of Schleswig, to Germany. Population, 23,000.

AL SIRAT ("The Path"), in the theology of the Mohammedans, is the name of a bridge extending over the abyss of hell, which must be passed by every one in order to enter paradise. It is described as being narrow like the edge of a sword.

ALSTON or **ALDSTON** is a small market town of Cumberland, situated in a wild and mountainous district on the confines of Northumberland and Durham, near the Tyne, 30 miles from Carlisle by road, and 32½ from London by the North-western Railway. It is about 1700 feet above the sea, and is considered the largest market town in England. There are some lead mines in the vicinity, in which silver ore is found. They are, however, not so productive as formerly. Copper is also worked in several mines. Many of them were formerly the property of the Earl of Derwentwater, but now belong to Greenwith Hospital, to which institution the estates of the earl were forfeited for his share in the rebellion of 1715. In connection with the drainage of the mines there is a subterranean canal 5 miles in length. In the neighbourhood the river Nut forms a romantic cataract. The town is irregularly built. The houses are chiefly of stone, covered with slate. The living of Alston is in the gift of the lords of the Airedale, who invariably present to it a chaplain of the rectory. Besides the church there are places of worship for dissenters, grammar and other schools, and a large town-hall, containing news and reading rooms, a mechanics' institute, and savings bank. Manufactures of cotton, thread, and carpets are carried on. Caverns and other natural curiosities abound. Traces of the Roman road (called Maiden Way), which traversed this parish, are still to be found, and there also exist the foundations of an ancient fortress on Hall Hill. The population of the parish in 1881 was 4621.

ALT, ALTISSIMO, in music. The notes in the first octave above the treble staff are said to be *in alt*, those in the next higher octave *in altissimo*.

AL TAI MOUNTAINS is the name given to that extensive range which forms the northern border of the high lands of Upper Asia, and separates Siberia from Mongolia. The range begins on the banks of the River Irtysh, 80 E. long., and extends till it reaches the Sea of Okhotsk, a gulf of the Pacific Ocean. It grows broader as it advances, spreading out into an immense mass in China to the south, and joining the Aldan Mountains to the north. The whole length from east to west is nearly 3000 miles, or with the Aldan range nearly 5000, while its breadth ranges from 200 to 700 miles.

The most western part of the Altai, lying between 80° and 89° E. long., is a mass of high rocks furrowed by narrow valleys and rapid rivers. It is called the Egtag Altai. Some of the mountains of this part rise to 12,000 feet, but the average is about 5000. The summits are not rugged peaks, but are nearly level plains of considerable extent, diversified with isolated masses of granite, and often covered with snow. The valleys which intersect the mountains commonly take the form of large oblong flat basins, with gradually sloping sides, each basin being followed by another somewhat lower. All the rivers which

rise in the Egtag Altai flow either into the Obi or into its greatest tributary, the Irtysh.

The mountain mass of Egtag Altai, near its centre, is composed of a diversified stratification of jasper, chalcodony, carnelian, slate, and other rocks, lying upon granite. The mineral riches consist of gold, silver, copper, and lead. The mines containing them were worked at some remote period, but by whom or when is not known. They were re-opened by the Russians in the last century, and have been since then extensively worked.

Among the vegetable productions of this region are poplars, willows, medlars, privets, whitethorns, and wild roses, on the low banks of the Irtysh; and large forests of larch, birch, and other trees, on the slopes of the mountain. The inhabitants use as a substitute for tea the dried leaves of the *Saxifraga crassifolia*. Agriculture is carried on, but not to a great extent, in the valleys. With the exception of mining, the chief occupation of the inhabitants is that of pasturing cattle. The animals found in this range are numerous, comprising bears, elks, stags, wolves, foxes, lynxes, sloths, hares, squirrels, beavers, otters, sables, martens, &c. The rivers contain excellent fish. The low lands swarm with mosquitoes at particular seasons.

Eastward of the Egtag range are three others which extend thence to Lake Baikal, called respectively the Sayans Kean, the Taigun Oöla, and the Ulai-Gum Oöla. These are all parallel, and at a considerable distance apart, so that there are extensive valleys between them. Many rivers, including the Yenesei, have their sources in these valleys and the neighbouring mountains. The botany, zoology, and agriculture of this region are very similar to those of the Egtag range, but the mineral produce is not so valuable.

The three ranges just described terminate on the east in an immense mountain mass, bounded on the south by the great desert of Gobi, and having Lake Baikal imbedded in its centre. These Baikal Mountains give rise to a large number of rivers, of which no fewer than 160 flow into Lake Baikal. This lake, the largest mountain lake in the world, is described under **BAIKAL**. All the water leaves the lake by one outlet, and forms a river which joins the Yenesei. Many parts of the Baikal range show unequivocal signs of volcanic agency. The plants, agricultural produce, and animals of this region are much like those further westward; but the mineral riches are of greater value, comprising, besides gold, silver, copper, and iron, such gems as carnelian, onyx, topaz, and amethyst.

Eastward of the Baikal group is the range called the Stannowoi Khrebet, which extends to the Pacific Ocean at the Sea of Okhotsk. The highest part of this range is near the sea shore. Towards the west and north the mountains descend in terraces and long-extended broad plains, overtopped by a few elevated summits of no great height. Few of them reach the line of perpetual snow. The valleys run mostly in the direction of the mountain chain, from south-west to north-east, and are joined together by a few transverse valleys, which carry the waters to the west.

The Altai Mountains are situated between two regions, which by their nature are unfit for agricultural purposes, except in a few isolated places, and which therefore, from time immemorial, have been inhabited by wandering nations who draw their subsistence from herds. The mountains, however, contain many valleys well adapted for agriculture, and there exist some indications that these valleys have once been cultivated, very probably by the same nation which worked the mines. This nation, which is known under the name of the Tabudes, is not named in history, and has entirely disappeared, though the immense number of ancient tombs found everywhere, but

especially on the mountains of Sayansk, evidently prove that this region was once better peopled. The nation was probably destroyed by its nomadic neighbours.

ALTAMURA, a handsome town of Italy, in the province of Bari, standing on a hill at the foot of the Apennines. It is surrounded by walls, and has an old castle, and a fine cathedral founded by Frederic II., ornamented with pictures. Considerable trade is carried on in oil and wine and in the other agricultural produce of the country. The ancient *Lupazia* is said to have occupied this site. The population in 1882 was 17,865.

ALTAR (Latin, *altare*, from *altus*, high), an erection on which to offer sacrifice. In the Old Testament the first altar mentioned is that erected by Noah when he quitted the ark, though offerings and sacrifices are spoken of previously to that period. The patriarchs Abraham, Isaac, and Jacob frequently erected altars, and it is probable that they were built from time to time as required during their journeyings. In the Pentateuch minute instructions are given as to the erection and construction of the altars, and there are frequent references to them in the historical, poetical, and prophetic books of the Old Testament. In the earliest period they were constructed of earth or of rough unhewn stone, and this form is strictly enforced in Exod. xx. 24, 25, and confirmed in Deut. xxvii. 5, while in the former passage the making of steps was also forbidden. At a later period, however, an altar was made of wood covered over with plates of brass, for the burnt-offerings; and another of wood covered with plates of gold, for the offering of incense (Exod. xxvii. 1-8; xxx. 1-5). In the temple still larger and more elaborate altars were constructed. They appear to have been built in ledges or steps, contracting towards the top; and in Ezek. xliii. 17, the prophet speaks of the stairs of the altar being towards the east. In the palmy days of the Jewish ritual the fire of the altars was never suffered to go out; and the offering of sacrifices for the nation, and the private offerings of individuals, must have kept them in constant use.

In the Christian Church the name altar was speedily given to the erections used for the bread and wine in the celebration of the Lord's Supper. These were in the earliest period constructed of wood, and were moved into the centre of the church or place of worship as required. When Christianity became the religion of the state, more pomp and ceremony was imported into public worship, and altars of carved stone were introduced. In 509 A.D., at a council held at Epaone, in France, it was decreed that none should be consecrated with the chrism except those built of stone. In England the change from wood to stone took place about the period of the Norman Conquest, and stone altars were in general use until the Reformation, when, during the reigns of Edward VI. and Elizabeth, they were removed from the churches and replaced by wooden tables. Some thirty churches are known to antiquaries where the old altar slabs still exist, but the high altar of Arundel Church, Sussex, is almost the only one still used. In 1845 it was decided by the Court of Arches that the erection of stone altars is illegal, and no attempt has been made to obtain a reversal of this decision. In the Greek churches but one altar is used, and this was undoubtedly the primitive custom; but the Latin Church, from a very early period, has admitted the use of more than one altar, and most of the large churches have several.

The ancient Egyptian altars were made of a single block of stone, generally about 4 feet in height, covered with hieroglyphics. Among the Greeks and Romans the altars erected to the highest deities were of considerable height and extent; those dedicated to the demigods and heroes lower and nearer the ground; and those of the infernal deities were trenches sunk below the surface.

ALTENBURG, a town of Germany, capital of the

duchy of Saxe-Altenburg, is situated near the left bank of the Pleisse, 24 miles south of Leipzig. The town, standing on uneven ground, is irregularly built, but has some fine streets and public buildings, and is the residence of the Duke of Saxe-Altenburg. Its ancient castle, situated on a lofty eminence, is celebrated as the place from which the young princes, Albert and Ernest, founders of the royal families of Saxony, were kidnapped. Altenburg also contains a cathedral, several churches, gymnasium, public library, hospital, theatre, &c. The chief branches of industry are manufactures of woollen cloth, ribbons, gloves, porcelain, leather, carriages, brushes, &c. There is also a considerable trade in cattle and corn. The population in 1882 was 26,241.

ALTEN OETTING or **ALTOETTING**, a small town of Upper Bavaria which has long been famous as a place of resort for Roman Catholic pilgrims, on account of a famous image of the Virgin Mary, called the "Black Virgin." The town also contains Tilly's Chapel, in which the great soldier found a resting place, and which is so greatly venerated that Maximilian I. and other royal personages have caused their hearts to be buried in it. Several German emperors have held their court here. Population, 2000.

ALTERATIVES, a term used in medicine to describe those remedies which are supposed to alter the condition of the blood and tissues without exciting any sensible action of the excretory organs. Thus mercury, which in some of its forms acts as an irritant, when administered in small doses and at intervals, may assist the digestive functions without otherwise affecting the constitution. Iodine and arsenic are used in a similar manner. The name is also used to denote a mild purgative.

ALTER'NATE. In geometry angles are said to be alternate which are made by two lines with a third on opposite sides of it.

In algebra those terms of a proportion are said to be alternate which are separated from one another by another term.

In botany leaves growing on opposite sides, but not springing from same point, as in marsh-mallow, are alternate leaves; stamens which come between the petals are said to be alternate, and so with the members of the other floral whorls.

ALTERNATION OF GENERATIONS is a term applied by Steenstrup to a group of phenomena in which a sexual living being gives rise to a progeny not resembling itself, and not possessing sexual organs, which progeny either itself or in two or three generations produces another sexual being like the first. An instance of alternation of generations is given under **JEINUM**.

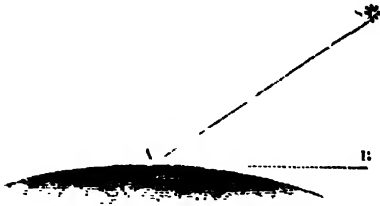
ALTHERA is a genus of plants belonging to the order **MALVACEÆ**. The outer calyx has from six to nine divisions.

Althæa officinalis, or marsh-mallow, is a plant the use of whose mucilaginous roots and leaves in all cases in which emollient or demulcent substances are required, is of great antiquity. Under the name of *guimauve*, the French use the roots in the preparation of a demulcent drink. The leaves are soft and downy, ovate, cordate, the upper ones three-lobed, the lower five lobed. The flowers are of a very pale lilac colour. It is a common European plant, and is often found in marshes, especially near the sea, in great abundance.

Althæa rosea (the hollyhock) is another species, found wild in China, and now extremely common in our gardens.

ALTITUDE (from the Latin *altus*, high) may be rendered by the English word *height*. This being the case we should have referred it to the English word, if the term were not particularly reserved in astronomy to signify, not the length, but the angle of elevation. Thus, if A be the

position of a spectator on the earth, and $A N$ the line on the horizon, which is drawn towards the point directly under the star s , the angle $n A s$ is the altitude of the star



The different modes of measuring altitude are shown in the Plate ALTITUDE.

To Measure Altitude by means of Staves.—Let $A N$ (fig. 1) represent an object of which the altitude is required. Being provided with two rods or staves of different lengths, plant the longest of them, as $C P$, at a certain measured distance from the base of the object; then at a further distance plant the second or shorter staff, $E D$, in such a manner that the tops of the two, E and P , may be in a line with the top of the tower N .

This being done, measure the distance, $E D$, as also the length, $E D$, and we shall have, by similar triangles, as

$$E D : E D :: P A : A N;$$

that is, by multiplying the second terms together, and dividing by the first, we shall have the altitude of the tower $A N$. For example, suppose $P A = 100$ feet, $E D = 8$ feet, and $E D = 4$ feet, then

$$A N, \text{ the altitude of the tower, } = \frac{4 \times 100}{8} = 50 \text{ feet.}$$

When the base of the object is inaccessible (as in fig. 2), two such operations as that above become requisite; thus—Let $E D = a$, $E D = d$, also the unknown distance $P A = x$, and the required altitude of the object $= y$; then in the second operation, in which both the staves must be replanted, make the second distance $P' A' = a'$, and the second unknown distance $P' A' = x' - c$, c being the distance between the two stations of the shorter staff, $E D$, $E' D'$; the lengths of the staves still remaining the same. Now, from the preceding proposition we shall have (by substituting for $E D$, $E D$, $P A$, and $A N$, the above letters)—

$$\text{First operation. } a : d :: x : y;$$

$$\text{Second operation. } a' : d' :: x' - c : y;$$

whence, by subtraction,

$$(a - a') : d :: c : y;$$

consequently,

$$y = \frac{A B \cdot d c}{a - a'}$$

To Measure Altitude by means of Shadows.—This is one of the most ancient methods of measuring altitude of which we have any record. It is said to have been first employed by Thales in measuring the height of the pyramids of Egypt. With this view he erected a staff, and at a certain time measured the length of its shadow; at the same time the length of the shadow of the pyramid was ascertained; then, knowing the length of the staff, the height of the pyramid bore the same proportion to it as the shadow of the pyramid to the shadow of the staff. For, in fig. 3,

$$c a : a b :: C A : A B.$$

To Measure the Altitude by means of Optical Reflection.—Place a mirror or other reflecting surface horizontally on the plane of the figure's base, as at c (fig. 4)—in which

case we suppose the object to be inaccessible—and measure the distance, $C A$. Now, retire back in the direction $A O$ to D , till the eye observes the top of the object exactly in the centre of the mirror, which, for the greater degree of accuracy, may be marked by a line across it. Then having measured the distance $D C$, and ascertained the height of the eye of the observer, it is evident from the equality of the angles of incidence and reflection, that

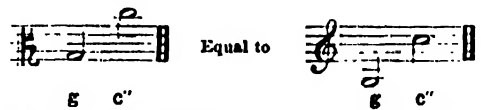
$$D C : D E :: C A : A B.$$

Multiply $C A$ by $D E$ and divide by $D C$, and you have the altitude of the object required.

Other means of measuring altitude are by the use of the BAROMETER and by SURVEYING, as described in those articles.

The altitude of the pole is the geographical latitude of the place of observation, and remains the same throughout the twenty-four hours; the altitudes of the stars and sun change with the diurnal motion, being nothing when they rise and set, and greatest when they are on the meridian.

ALTO, in music, is the next part beneath the treble. It is sung by the CONTRALTO (lowest female voice), or by the alto (highest male voice, generally in falsetto); the latter being almost peculiar to England. The compass of the male alto voice is from tenor G to middle C , and the proper ALTO STAVE is that which has the C clef on the middle line; but much modern alto music is written in the treble stave.



Alto Stave and compass of Male Alto. Ditto in Treble Stave,

The male alto is the highest voice in most of the best glees, and frequently takes a leading part in English cathedral music, lending a peculiar charm to these classes of composition not to be found in the music of any other nation. Sweetness and pathos are its distinguishing features. Handel's oratorios (as the part of Solomon in the oratorio of that name) not unfrequently contain important parts for the male alto.

Alto is also one of the names given to the viola, more often called the tenor in England, and bratsche in Germany. See VIOLA.

The *Alto Trombone* is the highest of the three varieties of that instrument. See TROMBONE.

AL'TON, a market town of Hampshire, near the source of the River Wey, 49 miles from London by road, 60 by South-western Railway, and 18 N.W. of Winchester. There are a paper mill, an iron foundry, and two well-known breweries in the town, and extensive hop plantations in the neighbourhood. Bombazines were once manufactured, but the trade is now chiefly agricultural, and there are some well-attended fairs and markets. Besides the ancient parish church, built in the reign of Henry VI., another, All Saints, was erected in 1875. There are chapels for various denominations of dissenters, schools, mechanics' institute, and museum. The town also possesses a cottage hospital and fine assembly rooms. The Royalist forces were defeated by the Parliamentarians here in 1643. Alton sent a member to Parliament in the reign of Edward I. The population in 1881 was 4497.

AL'TON, a town of Illinois, United States, in county Madison, on the left bank of the Mississippi, distant 21 miles from St. Louis, and 8 from the mouth of the Missouri. It has good river and railway accommodation, and carries on a large export trade in grain and other agricultural produce, lime, and coal. There are several churches and schools, a Roman Catholic cathedral, and a penitentiary. Population, 10,000.

ALTONA, the largest and most populous town in the Prussian province of Schleswig-Holstein, stands on the north bank of the Elbe, and so near Hamburg that the two cities are virtually united, being only separated by the state boundaries. The population is 91,047; of this number about 3000 are Jews, whose chief rabbi resides in Altona; the remainder are principally Lutherans, with some Calvinists and Catholics. In 1845 the population was only 32,000. The town contains several churches, a gymnasium or high school, an observatory, banks of savings and of exchange, and several charitable institutions. It is also a favourite resort of pleasure seekers, and contains numerous theatres, music halls, gardens, and cafés. The chief trade is with France, England, the Mediterranean, and the West Indies. Shipbuilding is carried on to a considerable extent, and several vessels belonging to Altona are annually employed in the herring and whale fisheries. Notwithstanding the rapid and, for a continental town, almost unprecedented rise of Altona, Hamburg maintains its pre-eminence. The most important manufacture of Altona is that of tobacco. One factory alone works up 600,000 lbs. per annum. The other manufacturing establishments are soap and oil works, dye-works for woollen goods, chemical and glass works, vinegar works, an extensive linen and cotton printfield, roperies, tanneries, and breweries famous for their beer. Railways from several parts of Germany have added greatly to the importance of Altona. Its harbour is only a winter haven of the third class; but the largest vessels once over the bar of Blakenese, can unload at the west end of the town. Altona, which occupies a loftier and consequently healthier position than Hamburg, was raised to the rank of a city by the Danes in 1644; it was burned by the Swedes in 1713, and is therefore a comparatively modern town. After the war of 1864 it passed out of the hands of Denmark, and is now part of Prussia. It is entitled to several commercial privileges.

ALT'ORF, the chief town of the canton of Uri, and the cradle of Swiss liberty, stands at the foot of the Grunberg, on the St. Gothard road, on the right bank of the Reuss, and near the entrance of that river into the Lake of Lucerne. It was the scene of many of the exploits of William Tell, and a colossal statue of him in plaster, presented to Altorf in 1861 by the riflemen of Zurich, is said to occupy the spot whence he fired at the apple on his son's head. A stone fountain marks the site of the tree under which his son stood, which is also commemorated by some rude frescoes on an old tower. Tell is said to have been born at Bürglen, a neighbouring village. The oldest Capuchin monastery in Switzerland stands at Altorf, at which is terminated the Swiss pass over Mont St. Gothard. Population, 3000.

ALTO-RELIEVO (high relief), a term which designates that kind of sculpture which is executed on a flat surface, but projects from the plane to which it is attached to the extent of more than one-half the outline of the principal figures. It is distinguished from *basso-relievo*, in which the figures are made to appear as projecting more than half their outline without actually doing so. The most legitimate use of alto-relievo is where it is introduced in alternate or occasional compartments to give relief by the boldness of its projections to the uniformity of a large surface. Such are the metopes among the Elgin Marbles, which, alternately with the triglyphs, ornamented the frieze of the entablature of the Parthenon. See GREEK ARCHITECTURE.

AL'TRINCHAM or **ALTRINGHAM**, a market town of Cheshire, 19½ miles from London by the North-western Railway, and about 9 miles W.S.W. of Manchester, on the railway to Crewe. It is situated on Bowdon Downs, and lies near the Duke of Bridgewater's canal.

It is a neat and clean town, surrounded by villas of Manchester manufacturers, who are attracted to it by its healthy climate and pleasant situation. Near the town are also some extensive market gardens, and large quantities of fruit and vegetables are sent to the Manchester market. The Church of St. John, erected in 1867, has a tower and spire 140 feet high, and accommodates 1000 persons. There are also Roman Catholic and Dissenting chapels. A handsome brick and stone building, which was reconstructed in 1864, is devoted to the Altrincham and Bowdon Literary Institute. There are in addition to the places mentioned a fever hospital, various charities, and also a very neatly arranged cemetery. The town-hall was erected by the munificence of the Earl of Stamford and Warrington. The population of Altrincham at the census of 1881 was 11,250.

ALTRUISM (Latin *alter*, other) is a name applied to those systems of ethics which place the happiness of *others* as the *summum bonum*—the highest good.

ALUM, in chemistry, is the name applied to the decahydrated double sulphates of the alkali metals and triatomic metals. They are a remarkable series of double salts, of which potash alum is the type. The alums are soluble in water, and their solutions have an acid reaction; they crystallize in regular octahedra. Exposed to moderate heat they first dissolve in and then part with their water of crystallization; at a still higher temperature they become almost insoluble in water, and at length lose sulphuric anhydride and become converted into basic salts. The formula of potash alum being $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$, the series of alums is formed by replacing the alumina by the sesquioxides of iron, manganese, or chromium, and the potash by soda, ammoniac, oxides of ammonium compounds, or the oxides of thallium, silver, rubidium, or cesium.

Potash alum occurs in a native state amongst the volcanic rocks near Naples, on the Rhine, and in many other localities, though only in small quantities. It was manufactured in the thirteenth century at Smyrna: from whence the business rapidly spread over Europe. The art of alum-making was introduced into England by Thomas Chaloner in the reign of Queen Elizabeth.

At La Tolla, in Italy, alum is prepared from a mineral called alunite or alum stone, which contains all the ingredients mixed with a little ferric oxide; the produce is called Roman alum. At the alum-works near Whitby, in Yorkshire, alum is produced from a stratum of aluminous schist, disposed in horizontal laminae, which is nearly 30 miles in length. The method of manufacturing is to mix the broken alum slate with brushwood for fuel, and to pile in a heap about 4 feet high; it is then ignited, and as it burns through, more rock is piled on to the burning mass until the calcined heap reaches the height of about 100 feet, its base at the same time increasing till it has an area of about 200 square feet. When the combustion is over, the residual matter, consisting of earth, oxide of iron, and sulphate of aluminium, is lixiviated with water—a solution of the earthy salt being obtained, which is boiled down until concentrated; the quantity of chloride of potassium necessary for the formation of the alum is then added, and the liquor run off into coolers to crystallize. The crystals are redissolved in as much water as is required to make a saturated solution at the boiling point, and the liquor run into casks. In sixteen days the casks are unhooped, when the alum is found solid on the outside, but in the interior in beautiful large crystals. This last process is called "roching." It requires about 130 tons of calcined aluminous schist to produce 1 ton of alum. Near Glasgow alum is manufactured from clay slate, which is obtained from coal mines, and contains a double sulphate of iron and aluminium. When the slate containing this double salt is put into water, it is dissolved; by partial evaporation,

crystals of sulphate of iron are obtained, and to the concentrated solution which remains, and which is principally sulphate of aluminium, potash salts are added, and crystals of alum are formed; these are purified by redissolving them in water, and by crystallization. Alum is also produced in chemical works by the direct union of the component ingredients.

Large quantities of ammonia alum, $\text{Al}(\text{NH}_4)\text{SO}_4 \cdot 12\text{H}_2\text{O}$, and soda alum, $\text{Al}(\text{Na})\text{SO}_4 \cdot 12\text{H}_2\text{O}$, are likewise annually produced artificially.

Alum is colourless, inodorous, has an astringent taste, and crystallizes generally in regular octahedrons; but by the addition of alumina, and particular management, it may be made to crystallize in cubes. It is brittle, and easily reduced to powder; its specific gravity is about 1.731; water at 60° Fahr. dissolves about one-eighteenth of its weight of alum, and boiling water about three-fourths of its weight. The solution reddens vegetable blue colours strongly; when exposed to dry air, alum effloresces slightly on the surface, but it remains long without undergoing any change internally.

The above-named properties relate to *common* or *potash alum*. *Soda alum* is produced by the action of sulphate of soda on sulphate of aluminium; and *ammonia alum* by the action of sulphate of ammonia on sulphate of aluminium. Their properties are very closely allied to those of potash alum.

Soda alum, $\text{Al}(\text{Na})\text{SO}_4 \cdot 12\text{H}_2\text{O}$, is found in nature as a fibrous efflorescence in the earth at the Solfatara, near Naples, in the island of Milo, and some other places. It is manufactured artificially in the same manner as potash alum. Ten parts of water dissolve eleven parts of soda alum.

Ammonia alum, $\text{Al}(\text{NH}_4)\text{SO}_4 \cdot 12\text{H}_2\text{O}$, is found native in octahedra and fibrous masses at Tscherning in Bohemia. It is also manufactured on a large scale from the ammoniacal effluvia of gas works. In most respects it resembles potash alum, and is used for the same purposes. Heated with acids it gives off ammonia. 5.2 parts dissolve in 100 parts of water at 32° Fahr., and 4.22 parts in 100 parts of water at 212° Fahr. Its specific gravity is 1.65.

Alum is decomposed not only by heat, but by many of the acids, alkalis, and carbonates. It is employed for a vast number of purposes. It is used in preparing lake colours, as a mordant in dyeing; burned alum is used to clean the bricks in calico printing to remove greasiness, leather dressings, and by candle makers to harden the tallow and render it white. It is added to size by paper-makers, and to paste by bookbinders, to prevent decomposition. The Chinese purify muddy water by addition of alum in the proportion of 7 grains per gallon. The mud coagulates, as brown streaks, and is immediately precipitated. In the H. Rhine is of Scotland pot-water is sometimes treated in this way. Alum-water is also used in bottling fruits for preservation. Wood and paper impregnated with alum are inflammable. In medicine it is employed as an astringent.

ALUM SLATE, a clay slate containing bitumen and sulphate of alum, from which, as its name implies, alum is prepared. It is found in Germany, Sweden, the North of England, Scotland, and other countries. The colour of this slate is black grey. Its hardness varies: at the top part of the stratum it may be crumbled between the fingers, whereas at a greater depth it is as hard as roofing slate. The specific gravity is about 2.48. By exposure to heat it effloresces, and acquires the taste of alum. *Grey alum slate* is a massive mineral of a bluish-black colour, and has a fine crystalline metallic lustre.

At Huntly, near Peterhead, and Campsie, near Glasgow, the alum slate consists of soft delicate fibres, easily separable from each other. It is entirely colourless, of a silky lustre, and has a taste resembling paper.

ALUM STONE or **ALUMNITE**, a basic sulphate of aluminium and potassium, found at La Tolla, in Italy. It is usually a grayish-white mineral, translucent and frangible, occurring in small masses and veins in a secondary rock. Some specimens are crystallized in the obtuse rhomboid form. These have the composition $\text{Al}_2\text{K}_2\text{SO}_4 + 3\text{Al}_2\text{H}_6\text{O}_6$.

ALUMBAGH ("Garden of the Lady Alum," or "Beauty of the Soil"), a park-like inclosure, surrounded by a wall, containing a mosque, temple, palace, and other buildings, and beautiful garden, about 4 miles from Lucknow. In the mutiny of 1857 it was converted by the rebels into a fort, but was afterwards captured by a small British force, whose gallant defence of it in the face of overwhelming numbers will ever remain memorable in history. See SEPOYS.

ALUMINA (Al_2O_3), the earthy oxide of aluminium, sometimes called argil, or argillaceous earth, constitutes the larger portion of all clays, and their plastic property is owing to it. Alumina forms the greater part of the crust of the earth, and in its common form of clay it affects the fertility of all soils. It is not taken up by plants, nor is it found in the animal kingdom. The adamantine sapphire or corundum, the ruby, and sapphire, oriental topaz, oriental amethyst, &c., are alumina nearly pure and crystallized, differing from one another chiefly in colour. An opaque variety of corundum, termed emery, when powdered is used for polishing precious stones, &c. These substances have not, however, any of the more obvious properties of common clay, for instead of being amorphous, soft, and diffusible through water, they are crystallized, are among the hardest substances in nature, and will not mix with water. The diaspor is a crystallized mineral, which consists almost entirely of alumina and water; and in North America another hydrate of alumina has been found, and called Gibbsite.

Alumina is white, powdery, and light, if it has not been exposed to a high temperature; after ignition, however, it cakes together and becomes exceedingly hard. The specific gravity of alumina is after ignition 3.999, which is about that of native corundum. Alumina has neither taste nor smell, and it adheres to the tongue. It is insoluble in water, but considerable affinity exists between them, as is shown by the high temperature required to decompose the hydrate. It shrinks considerably by heat, and may be fused at a high temperature. Alumina is not in itself either acid or alkaline; but it combines with numerous acids to form salts, among which the *acetate of alumina* is much employed in calico printing. It also combines with potash, soda, lime, and magnesia, so as to form salts called *aluminates*.

There are three hydrates of alumina, containing respectively one, two, and three atoms of water. The monohydrate ($\text{Al}_2\text{H}_2\text{O}_4$) is found native as *diaspor*, a translucent mineral of the specific gravity 3.43; it is converted into a powder when heated, and loses its water at 360° C. The dihydrate ($\text{Al}_2\text{H}_4\text{O}_5$) is formed from the diacetate. The trihydrate ($\text{Al}_2\text{H}_6\text{O}_6$) is prepared by adding ammonia or alkaline carbonates to solutions of aluminium salts. At a strong red heat it parts with its water, and loses bulk. The trihydrate of aluminium has an extraordinary attraction for all kinds of organic matter. When digested with liquids containing colouring matter in suspension, it combines with them, forming precipitates called lakes, which settle down, leaving the liquor colourless. Cotton goods impregnated with alumina fix colours in a similar manner; hence the great value of aluminous salts as mordants.

ALUMINA, ACETATE OF. See ALUMINA.

ALUMINATES. See ALUMINA.

ALUMINIUM (Al; atomic weight, 27.4), the base of alumina. Davy procured aluminium by voltaic electricity, and by the action of potassium in vapour upon alumina

heated to redness; but it was not reduced to a perfectly metallic state till 1828, when Wöhler obtained it in the form of minute globules which, reduced to powder and burnished, shine like tin. In 1845 Wöhler obtained it in the form of a metallic button by passing the vapour of chloride of aluminium over heated potassium. In 1854 Deville commenced a series of researches which have resulted in the preparation of the metal on a large scale for manufacturing purposes, and at a price which renders it available for a large number of useful purposes. The properties of aluminium are, that it is a bluish-white metal resembling silver, malleable, and ductile. When cast into moulds, it is a soft metal like pure silver, and has a density of 2.56; but when hammered or rolled it becomes as hard as iron, and its density increases to 2.67. It is lighter than glass, and only one-fourth as heavy as silver. Its melting point is between that of silver and zinc. It is nearly as good a conductor of electricity as silver, does not oxidize in the air even at a red heat, does not decompose water except at a white heat, and is not blackened by sulphuretted hydrogen. It is not attacked by nitric or sulphuric acids, but is readily dissolved by hydrochloric acid. Caustic soda and potash readily dissolve it, forming aluminates. By immersing it in a heated solution of potash, the surface becomes frosted, and loses its peculiar blue or zinc hue, equalling frosted silver in appearance and durability.

ALUMINIUM BRONZE, an alloy consisting of 10 of aluminium and 90 of copper, of a beautiful gold-like colour, patented in 1862. It has the composition Cu_9Al , has the colour of gold, and takes a high polish. It is used for chains, watch-cases, bushings for machinery, &c. Its tensile strength is 73,185 lbs. per square inch. Its resistance to compression is 132,416 lbs. to the square inch, that of cast-iron being 115,542 lbs. Its specific gravity is 7.689, nearly the same as iron.

ALURED, ALRED, or ALFRED, of Beverley, an English historian who lived in the twelfth century. He is the author of an "Epitome of British History," to the twenty-ninth year of Henry I. It is written in a Latin style remarkable for its correctness, considering the age in which the author lived. It exhibits, however, in many places a strong resemblance to the similar work which bears the name of Geoffrey of Monmouth.

ALUTA or ALT, a tributary of the Danube, which rises in Transylvania, in the eastern Carpathian Mountains. It takes a general south course through Wallachia, and joins the Danube near Nikopolis. Its length is about 300 miles.

ALVA, a town of Stirlingshire, on the small river Devon, lies at the foot of Craigleith, in the Ochil Hills, about 7 miles N.E. of Stirling. It has manufactures of tartans, blankets, serges, tweeds, handkerchiefs, plaids, and shirtings, and carries on yarn spinning. In the Glen of Alva, near the town, are some very fine waterfalls. The population in 1881 was 5113—an increase of 817 from 1871.

ALVAREZ, DON JOSÉ, a sculptor of the eighteenth century, was born at Priego, in the province of Cordova, 23rd April, 1768. His father was a stonemason. Alvarez evinced an ability for sculpture at an early period, and employed what time he could spare from his daily labour at his father's trade to educate himself in the art. In his twentieth year he made such progress as to obtain admission into the Academy of Granada. He became subsequently a student of the Academy of San Fernando at Madrid. In 1799 he was granted a pension of 12,000 reals by Charles IV. to enable him to prosecute his studies in Paris and in Rome. In 1804 Napoleon, then emperor, paid two visits to the studio of Alvarez, and presented him with a gold medal. Notwithstanding this personal honour

Napoleon's after-conduct regarding Spain excited in Alvarez an invincible aversion to him; he would never model his bust; and when Joseph Bonaparte was proclaimed king of Spain, Alvarez, then at Rome, was imprisoned in the Castle of St. Angelo for refusing, as a pensioner of the Spanish government, to take the oath of allegiance to the new king. He was, however, released shortly afterwards. Henceforward he chiefly resided at Rome.

In 1825 he was appointed principal sculptor to the King of Spain, and was decorated with the cross of Civil Merit. In 1826 he visited Madrid for the purpose of selecting the best statues and other sculptures in the king's palaces to be placed together in the museum of the Prado; but he died within twelve months of his arrival, in the sixtieth year of his age.

It is generally admitted that Alvarez excelled in many qualities of a high order, in invention, in expression, and in design; and he is by his admirers compared with Canova.

ALVAREZ, FRANCISCO, a Portuguese traveller, was born in the latter part of the fifteenth century, in the town of Coimbra. King Emanuel of Portugal, in consequence of overtures from David, emperor of Abyssinia, in 1515, sent Edward Galvão on an extraordinary embassy to David, and Alvarez was appointed his secretary. Galvão died, but a new ambassador being appointed the expedition landed at Arkeeko, on the Abyssinian coast, on the 7th of April, 1520; and they arrived at the emperor's residence in Ambara, after passing through the countries of Tigre and Angot. After some years' residence in that city and country, Alvarez returned to Lisbon on 24th July, 1527. The king rewarded him with a handsome bench, and ordered him to publish an account of his travels. Alvarez published his work at Lisbon, in one volume folio, a copy of which is in the British Museum. In his relation the traveller speaks more of the country than of himself. The simplicity and frankness with which it is written are admirable. It bears the stamp of truth in every page. It is unfortunate that the writer gives no exact notions of the relative position of places or of distances, particularly as he traversed and visited the then almost unknown countries of Angot, Ambara, and Effit. Alvarez died in 1540. ("Mariani," book xxx. ch. 23-25.)

ALVERSTOKE, a parish in Hampshire, comprising the town of Gosport and the watering-place of Anglesey.

ALWAR, a semi-independent state of Ropar, formerly known as *Machery*, under the political control of the governor-general's agent, is bounded on the N. by the British district of Gurgaon, S. and W. by the state of Jaipur, and E. by the state of Bhartpur. It is mountainous in the west, but open and well cultivated in the east. Iron, copper, and other minerals are abundant in the hilly districts; cotton is extensively cultivated and exported. The river Sabli flows through Alwar, which is intersected from N. to S. by the state railway. The road communication, which was very bad, has recently been improved. The greatest length from E. to W. is about 60 miles, and 80 from N. to S.; total area, 3000 square miles. Population, mostly Mewattis, a somewhat savage race, 800,000.

ALWAR, capital of the above state, is situated about the centre, and protected by a strong fortress on the adjoining rocky heights. The city has five gates, is well paved, and contains the rajah's palace, a temple, and other buildings. The Lake of Siliserh, 9 miles distant, yields the water supply by means of an aqueduct. Alwar is about 85 miles S.S.W. of Delhi, and 94 W.N.W. of Agra. Population, 52,357.

ALYPIUS, author of one of the few Greek musical treatises known, which consists of a short introduction, followed by a complete list of the signs used by the ancient Greeks to express the notes of music. These were single letters or parts of letters, either in their usual position or

distorted in various ways, and quite irregularly chosen. Each note, moreover, had two distinct signs, one if used for the voice, and the other if for an instrument. Alypius, while giving us the complete notation, has unaccountably omitted to preserve for us any of the music. What little we have comes from other sources. His date is uncertain, but the balance of probability sets it at about 110 n.c.

ALYTH, a town in Perthshire, pleasantly situated near the Isla, a tributary of the Tay, and at the foot of a hill 17 miles W. by S. of Forfar. It has some manufactures of linen and yarn. The ancient Gothic church, which had been for a long time out of repair, was demolished, and a handsome church erected in 1839. There are several other places of worship. Alyth was constituted a royal burgh in the fifteenth century, but never sent members to Parliament. The population in 1881 was 2377.

AMADEUS (Latin, *Amadeus*, "Love God"), a common name in the house of Savoy. The first to bear it was Amadeus I., who was the son of Humbert I., count of Maurienne, in Savoy; but the first to attain any eminence was Amadeus V., surnamed the Great, who was born in 1249, and succeeded his uncle Philip in 1285. By his marriage with Sybilla, countess of Bugoy and Bresse, these districts of ancient Burgundy were added to his possessions. He further increased his domain by purchase, and was created a prince of the empire by Henry VII. in 1310. He rendered great assistance in the defence of Rhodes against the Turks in 1315, and died at Avignon in 1323.

Amadeus VI., called the "Green Count," was born in 1334, and succeeded his father in 1343. He was an able and sagacious ruler, and after a successful war against the French in 1354 he succeeded in greatly extending his dominion and influence in Italy. He engaged himself in a crusade, and restored and then quarrelled with the Greek emperor, John Palæologus. He founded the order of the Amadeidae, and died in 1383.

Amadeus VIII. was born in 1383, and assumed the government in 1398. He was created first Duke of Savoy in 1416 by the Emperor Sigismund, who declared the court of the duchy to be independent of the imperial chamber. He gave his subjects a code of laws called "Statuta Sabaudie," and under his judicious rule his subjects enjoyed a long period of peace, though the countries around them were a prey to foreign and civil wars. In 1434, after the death of his wife, he intrusted the administration of his states to his son Louis, and retired to a hermitage at Ripaille, a beautiful spot on the shores of the Lake of Geneva. The council assembled at Basle having deposed Eugenius IV. in 1439, Amadeus, though not in orders, was elected his successor; and having definitely abdicated his temporal sovereignty, was crowned pope at Basle in June, 1440. A stormy contest followed, and for nine years there were two popes in the field contending for the Papal chair. France, England, Spain, and Lombardy acknowledged Amadeus, who took the title of Felix V.; while the rest of Italy and the Venetians supported Eugenius, who continued to reside at Rome. In 1449, Eugenius having died, Amadeus claimed his claim in favour of Nicholas V., who had been elected on the death of Eugenius, and retired again to Ripaille. He died at Geneva in 1451.

AMADIS DE GAULA, the hero of an old romance of chivalry, written in Portuguese by Vasco de Lobeira, towards the end of the thirteenth century. It was afterwards corrected and edited in modern Spanish by Garcia Ordoñez de Montalvo, about the middle of the fifteenth century, and became a very popular book in Italy and France. It was translated into French by D'Herberay, and printed in 1557, with many additions, under the misnomer of the "Amadis des Gaules," meaning France. The original Spanish romance Gaule is Wales; and the

subject, characters, and localities are British. The "Amadis" is considered as one of the most interesting works in the whole library of chivalry and romance. There are also several other Spanish romances concerning Amadis and his family, which are, however, deservedly forgotten. The exaggerated sentiment of this and other similar romances of chivalry called forth the immortal "Don Quixote" of Cervantes.

A'MADOU is a brown leathery substance prepared from the *Polyporus fomentarius* and *Polyporus ignarius*, fungi which grow on the trunks of cherry, ash, and other trees. Its fungus is perennial, and increases yearly in size. Its soft spongy substance, after removing the outer covering, is cut into thin slices, and beaten with a mallet to soften it. In this state it is used, though not now in England, for stopping hæmorrhages, and for other surgical purposes; and by subsequent boiling in a strong solution of saltpetre it is prepared for use as tinder, constituting the *German tinder* of the tobacconists. To render it very inflammable it is sometimes imbued with gunpowder, which gives it a darker colour.

AM'ALEKITES, a nation who dwelt south-west of Palestine, between Edom and Egypt (Gen. xiv. 7; Exod. xvii. 8-16; 1 Sam. xv. 7). According to Josephus ("Antiquities," iii. 2), those who dwelt in Gobiolitis and Petra were called Amalekites, and were the most warlike among the surrounding nations. He calls their country *Amalekitis*, and describes it as a part of Idumæa ("Antiq." ii. 1). Josephus also calls the country of Midian Amalekitis, and says that it was situated between Pelusium, on the borders of Egypt, and the Red Sea ("Antiq." vi. 7; s. 3, and ch. 8). It appears also that they occupied several places in Palestine among the Canaanites; and in the land of Ephraim we find a mountain of the Amalekites where Abdon, the son of Hillel, was buried in Pirathon.

AMAL'FI, a town in the south of Italy, stands on the declivity of a hill overlooking the Gulf of Salerno, 24 miles S.E. of Naples. In the early part of the middle ages Amalfi was a republic, with a scanty territory, but renowned for its trade with Egypt and the East; its inhabitants then numbered 50,000. It took part in the crusades, and its citizens founded in Palestine the hospital of St. John of Jerusalem, from which the celebrated military order took its name. It is the seat of an archbishop, has an ancient cathedral, and a population of 7000, who occupy themselves with fishing and the manufacture of silk, paper, and macaroni. The town is much fallen from its former prosperity. After its conquest by Robert Guiscard the Norman, at the end of the eleventh century, it is described by William of Apulia as the great mart for Eastern goods, frequented by "Arabs, Indians, Africans, and Sicilians." It founded the maritime laws of Italy (*Tabula Amalphitana*). Amalfi was taken from the Normans in 1137 by the Pisan fleet for Innocent II.; and it was during this struggle that the celebrated MS. of the Pandects of Justinian, now one of the principal treasures of the Laurentian library at Florence, fell into the hands of the Pisans. The town suffered greatly from a storm in 1343. Flavio Gioja, who is said to have discovered the mariner's compass about the year 1302, and Masaniello the fisherman, who was for a short time the ruler of Naples, were natives of Amalfi. See ANIELLO, TOMMARO.

AMAL'GAM, a compound of two or more metals, of which one is always mercury; and this circumstance distinguishes an *amalgam* from an *alloy*. Nature presents us with only one amalgam, which is of silver, and is termed by mineralogists *native amalgam*. It is met with either semifluid, massive, or crystallized in rhombic dodecahedrons. Klaproth found it to consist of 64 parts of mercury and 36 of silver, out of 100 parts. Most metals may be amalgamated with mercury, and the combination

appears to depend on chemical affinity. When the cohesion of a metal is slight, as in the case of potassium and sodium, or when its affinity for mercury is considerable, as in the instances of gold and silver, amalgamation takes place readily by mere contact. When, on the other hand, the cohesion of a metal is strong, or its affinity for mercury is weak, heat or intermediate action, or both, are requisite to effect amalgamation. The density of an amalgam exceeds that of the mean of the metals. This and the tendency exhibited by one or both metals to oxidize, are indications of chemical combination. Antimony offers an example of metals which will not amalgamate without heat. In order to effect combination it must be melted, and while liquid mixed with hot mercury. Mere heat causes scarcely any action between iron and mercury. It has been stated that they may be amalgamated by mixing the filings of the metal with powdered alum, and rubbing them together in a mortar with a little water. After trituration the alum may be washed out. By the intervention of tin or zinc, iron may be combined with mercury, and a double amalgam is formed. Platina also unites with mercury by the intervention of the amalgam of potassium, but not by direct action. As the mercury is in all cases easily expelled by heat, amalgams are used as a means of applying these metals to many useful purposes. Metals covered with an amalgam of gold, and then heated, become finely gilt.

Amalgams are either liquid, soft, or hard—their form being dependent in some cases upon the quantity of mercury employed, and in others upon the nature of the metal amalgamated: thus, an amalgam consisting of 80 parts of mercury and 1 part of sodium is solid, whilst a compound of 15 parts of mercury and 1 part of tin is liquid. The liquid amalgams resemble mercury in appearance, except that the greater part of them flow less rapidly; solid amalgams are brittle. In general, amalgams are white; they are all crystallizable, and then form compounds of definite proportions. The amalgams of the more oxidizable metals, as of potassium and sodium, are decomposed by exposure to the air by absorption of oxygen, and they decompose water with the evolution of hydrogen gas; the double amalgam of iron and zinc does not rapidly undergo any change, and is not attracted by the magnet. All amalgams are decomposed by a red heat, the mercury being volatilized, and the more fixed metals remaining. The process of amalgamation and decomposition is employed to separate gold and silver from their ores; the mercury obtained by decomposing the amalgams is distilled, and repeatedly used for the same purpose, with comparatively little loss. The amalgams of gold and silver are employed in the processes of gilding and plating. The amalgam of tin is largely used in what is termed silvering mirrors, and various amalgams of tin and zinc are employed for exciting electricity in the machine. The amalgam used for the rubbers of electrical machines consists of 4 parts mercury, 2 zinc, and 1 part of tin. The zinc is first melted, the tin added, and then hot mercury is stirred in. Amalgams freed from excess of mercury become very hard; hence silver and gold amalgams are sometimes used for stopping teeth, but the mercury which they contain renders their use very objectionable. Some curious effects result from the action of amalgams upon each other; if mercury be added to the liquid amalgam of potassium and sodium, an instant solidification ensues, and heat enough to inflame the latter metals is evolved. When, on the other hand, a solid amalgam of bismuth is put in contact with one of lead, they become fluid, and the thermometer sinks during their action. There is a curious compound called an amalgam of ammonia, the real nature of which was long misunderstood, but of late years it has been conclusively proved to be merely a spongy mixture of metallic mercury with bubbles of ammonia and hydrogen gases.

AMALIA, Duchess of Weimar, has earned a place in history by her patronage of genius. Left at the head of the government of the duchy at an early age by the death of her husband, she made the city of Weimar the resort of the most distinguished literary men of Germany. Wieland, Herder, Schiller, and Goethe formed a constellation of talent of which any city might be proud. The Duchess Amalia withdrew from public life in 1775, having given up the sovereign authority to her eldest son, then of age, but continued her encouragement of letters and the arts in private life. She died in 1807, aged sixty-eight.

AMAND LES EAUX, ST., a town of France in the department of Nord, on the river Scarpe, about 7 miles N.W. of Valenciennes. The district in which St. Amand stands produces great quantities of excellent flax, in which there is a considerable trade. Porcelain, lace, and leather are manufactured. There are mineral waters and baths in the vicinity, which are much frequented. The fountains of the town are supplied from artesian wells. The population in 1882 was 11,000.

AMAND-MONTEBOND, ST., a town of France in the department of Cher, stands at the junction of the Marmande and the Cher, 25 miles S.E. of Bourges. It is one of the most active towns in the department, and is the mart of the grain, chestnuts, wine, ship-timber, and fat cattle of the district. It possesses a college and an agricultural society. The population in 1882 was 8,500. There are several other small towns of the name of St. Amand in France.

AMARA or AMARASINHA, an ancient Hindu grammarian, and author of one of the oldest and best original vocabularies of Sanskrit nouns, called after his name "Amara Kosha" (that is, the Thesaurus of Amara), but sometimes quoted under the title of "Trikaṇḍa" (that is, the Tripartite). Numerous authorities assert that Amara was a contemporary of King Vikramaditya, who flourished in the latter part of the fifth century; and his name is included in a memorial verse among the Nine Gems, or nine distinguished poets and scholars who adorned the court of that prince.

Like other original Sanskrit vocabularies that of Amara is in metre, to aid the memory. The whole is divided into three books. The Sanskrit dictionaries or "koshas" do not include the verbs of the language, the stems or roots being arranged and explained in separate lists. The "Amara Kosha" contains only about 10,000 different words. In a language so copious as the Sanskrit this number appears small; but in consequence of the great regularity with which Sanskrit compound nouns and derivatives are formed, very few of these require to be inserted in a dictionary.

An excellent edition of the "Amara Kosha," with marginal explanations and notes in English, and an alphabetic index, was published by Mr. H. T. Colebrooke at Serampore, 1808, 4to; reprinted 1829, 8vo.

AMARANTA CEE, an order of plants, the species of which are found chiefly in tropical countries, where they are often troublesome weeds. The cock's-comb, the globe-amaranth, the prince's-feather, the love-lies-bleeding of our gardens belong to the order, which does not contain a single species in which any deleterious property has been found. Amarantaceæ belong to the dicotyledonous division of plants. There are no petals, but the flowers are collected into heads or spikes, and become still more conspicuous in some species by the calyx and surrounding bracts being coloured pink, orange, or crimson. The stamens spring from below the ovary, and are opposite to the sepals. The ovules are attached from the base in the centre of the single one-celled ovary; in the mature seed the embryo is curved round the endosperm.

AMARAPURA (literally "the city of the gods," but

now a city of the past) is situated on the east bank of the Irrawaddy, in Independent Burmah, 6 miles E. of Ava. It was founded in 1783 by the monarch then on the Burmese throne, and was declared the capital of the empire. The seat of government was afterwards removed to Mandalay, 9 miles higher up the river. In March, 1810, nearly the whole of the city, consisting of 20,000 to 25,000 houses, was burned to the ground. The population at that time was estimated at more than 170,000; but owing to this calamity and to the removal of the seat of government in 1819, and also to an earthquake in 1839, the town was to a great extent deserted, and the present population is estimated at about 27,000. Scarcely any remains of the former city now exist, except a few rows of beautiful trees and some ruined pagodas. The present houses are chiefly built of bamboo. The most remarkable edifice is a celebrated temple adorned with 250 pillars of gilt wood, and containing a colossal bronze statue of Buddha. Remains of the ancient palace of the Burmese emperors still exist in the centre of the town. At the time of its prosperity Amarapura was defended by a fort, whose walls were 20 feet high and 7000 feet long, surrounded by a broad moat.

AMARYLLIDACEÆ, or the Narcissus tribe of plants, is a group of monocotyledonous genera. Their bulbs are dangerous poisons. The juice of that of *Hemerocallis tortuosa* is inspissated by the Hottentots, who smear their arrow-heads with it; other kinds are not less fatal, and even the common daffodil contains within its leaves an acrid irritating principle which renders it a powerful emetic. Like many other poisonous families, this occasionally secretes a kind of faecula or flour, which, when separated from the juice which is naturally mixed with it, becomes a wholesome article of food. The arrowroot of China is yielded by an *Alstomeria* which belongs to *Amorphaceæ*. The species, which are chiefly scattered over Brazil, Africa, and tropical Asia, are nearly all bulbous; a few only acquire a high degree of development and lose their bulbous character, as the *Doranthus* of Australia, and *Agave* of American Aëre. The snowdrop and crocus belong to *Amorphaceæ*. This order is nearly allied to the Liliæ and Iridæ; from the former it differs chiefly in being inferior, and from the latter in having six stamens with the anthers turned inwards.

AMASIA or **AMASIYAH**, a town of Asia Minor, on the Yeşil-Irmak, or Iris, lies in a narrow gorge 80 miles from the mouth of the river, and 200 miles S.W. of Trebizond. The houses are neatly built; but the city lies in a fire situation, and there are some splendid ancient remains in the neighbourhood, the principal of which are the *Areopolis*, the tombs of the kings of Pontus, and a famous mosque. Strabo, the Greek geographer, whose description of Amasia (*Casab.* p. 561) is virtually correct, writes that King Mithridates were natives of this place, who was long a seat of the Osmali sultans. The city is crossed by three stone bridges, one of which is supposed to be Roman, and a wooden one. The numerous gardens and fruit-plantations, with which the district is encircled, are watered by means of irrigation. Much wheat is produced, also wine, cotton, wheat, and salt. There are several large numbers of flour mills turned by water, and several silver and copper mines. Amasia is the seat of an Armenian Bishop. Population, 30,000.

AMATI, the name of a famous family of Cremona violin makers. Andreas Amati was born about 1525, and was originally a maker of the *Violon da Gamba*. Late in life he became a pupil of Gaspar di Salò, of Brescia, the inventor of the violin, and with his brother Nicolaus became famous as a maker of the new instrument. His sons, Giovanni and Hieronymus, worked together in partnership; Giovanni being the *Brezian* model, with high curved back and flared ribs, and straight stiff sound holes, &c.

Nicolaus (Nicolo)—son of Hieronymus, and grandson of Andreas—the greatest of the family, was born in 1596, and died in 1684. He greatly improved the model of the violin, and practically founded the Cremona school. Guarnerius and the unrivalled Stradivarius were his pupils. His own son, another Hieronymus (or Geronimo), was not at all equal to his great contemporaries. The tone of Nicolo Amati's violins is very clear and sweet, but deficient in depth and power as compared with those of his famous pupils. The names Andrea, Antonio, Nicolo, and Geronimo, are always used by the makers, in their labels, in the Latin forms, *Andreas, Antonius, Nicolaus, and Hieronymus*.

AMAURO'SIS, the name given to those forms of imperfect vision or total loss of sight which arise from unhealthy changes in the back of the eye or the optic nerve. It arises from a great variety of causes, among which may be mentioned the debility which springs from fever, prolonged diarrhoea, or great loss of blood; from the administration of such poisons as belladonna or stramonium in large doses; or from the administration of long-continued small doses of certain poisons, such as mercury and lead, or the immoderate use of tobacco. The most general cause of amaurosis, however, is the excessive strain put upon the eyes by great exposure to heat and light, their prolonged employment in the examination of minute objects, and their long exercise in hot, badly-ventilated rooms by the aid of artificial light. Smiths, stokers, watchmakers, draughtsmen, composers, and needlewomen are peculiarly exposed to this disease. The symptoms vary with every patient, but generally include a difficulty in reading or writing in the outset, the appearance of small black specks or floating particles before the eyes, a mist between the eye and the object looked at, flashes of blue or yellow light when the eyes are closed, and a gradual failure of vision, which continues until the power to distinguish objects is lost. The disease may be confined to one eye or may extend to both; may be temporary, intermittent, or permanent; and may come on suddenly, though in the large majority of cases it develops by slow degrees. The treatment of this disease must be adapted to the peculiar circumstances of each case. In the feeble and debilitated efforts should be made to strengthen the system, and good living, change of scene, and fresh air, with the administration of quinine and steel, will be found very beneficial. The bowels should be freely relieved and kept open, and the eyes should be protected from a strong light and when out of doors by spectacles of a light blue tint. On the other hand, in persons of a robust temperament, depletion may be necessary. Counter irritation, by means of blisters or issues behind the ears, is often of great service. In all cases medical advice is necessary, and resort should be had, when possible, to those members of the profession who make the eye their special study.

It may be necessary to mention here that while the appearance of floating specks or motes before the eyes may be a sign of approaching disease, they are frequently observed by persons who enjoy a healthy and strong sight, and do not of themselves indicate any failure of vision.

AMAZIAH or **AMAZIAHU** means literally "one strengthened by Jehovah," and is the name of the ninth king of Judah, who began to reign when he was twenty-five years old, about the year 838 B.C., after his father Josiah had been murdered in the house of Millo by his own servants, Jozacher and Jehozabab (2 Kings xii.). Amaziah reigned twenty-nine years in Jerusalem; his mother's name was Jehoadan, of Jerusalem. He fought with the Edomites, of whom he slew 20,000, and took Selah, and called it Joktheel. The name of Selah is translated *Petra* ("rock") by the Greeks. The remains at this place in Arabia Petraea, between the Dead Sea and the

Elanitic Gulf, are described by Irby and Mangles ("Travels," p. 396, &c.) Amaziah next declared war against Jehoash, the king of Israel, but was defeated and taken prisoner. Jerusalem was also taken and plundered. Amaziah, however, recovered his liberty, and reigned fifteen years after the death of Jehoash, when, a conspiracy having been formed against him, he fled to Lachish; but he was pursued and slain there, and buried in Jerusalem. He was succeeded by his son.

AM'AZON, MAR'ANON, ORELLANA, or SOLIMOENS is the name given to a river which traverses the equatorial region of South America nearly in its whole extent, running chiefly from west to east, and having its embouchure almost under the equator. It is the largest river on the globe in regard to its volume and the area of its basin.

Geographers are not agreed respecting the true source of this river. The head stream is either the Marañon, also called the Tunguragua, or the Ucayale. The former issues in two streams from Lake Lauricocha, situated among the Andes in 10° S. lat., about 75 miles from the Pacific, and after flowing in a north-westerly direction, parallel to the Ucayale, takes an easterly course, and joins that river at St. Joaquin de Onaguas. The Ucayale also has its origin in Peru, its upper branches—the Apurimac and Puro—rising within 60 or 70 miles of the N.W. corner of Lake Titicaca. It is the longer river of the two, and is here larger than the Marañon. The united stream, which forms part of the boundary between Peru and Ecuador, thenceforth pursues an easterly course through Brazil, receiving on its way to the North Atlantic Ocean numerous important tributaries. From the junction of the above rivers the Amazon passes through 20 degrees of longitude, and is in no place far removed from the equator. The principal feeders of this mighty river are, on the north bank—the Napo, the Putumayo, each about 700 miles in length; the Japura, about 1100 miles; and the Rio Negro, 1300 miles. On the south, besides the Huallaga, which discharges its waters into the Marañon, the Amazon receives the Yavari, the Yutai, the Yurua, the Tefe, and the Purus; also the following more important ones—the Madeira, 2000 miles; the Topajós, 1200; the Xingu, 1300; and the Tocantins, 1100. By means of the Cassiquiare, a cross or diagonal river, and tributary of the Rio Negro, the Amazon has a remarkable connection with the Orinoco. Altogether it is estimated that this noble stream and its tributaries drain nearly 2,500,000 square miles, or more than a third of South America, the inland navigation which it affords being computed at 50,000 miles.

Towards its embouchure the Amazon divides into two branches, of which the northern is by far the broader, and retains its name; the other outlet is called the Para. Of the numerous islands formed by this river, the principal are Marajo or Joannes and Caviama, situated at its mouth. The width of the channel between the last-named island and the continent is about 18 miles, but towards the sea it widens to about 50. The distance from bank to bank, in a river of such enormous extent, of course varies considerably. In the upper part of the Marañon, some distance below Jaen, it is rather less than 300 yards in width; while lower down, at the rocky pass of Pongo de Manseriche (in 76° 50' W.), near San Borja, it contracts from 500 yards to 50. From this point to the mouth there is neither rapid nor cataract, a distance of 3000 miles, though there exist some dangerous shoals. At its junction with the Napo it measures more than a mile across, the width being still further increased to 3 between the Negro and Madeira; while 300 miles from the sea the distance from shore to shore is so great, that even in the centre of the stream the land is indistinguishable. At its mouth the width is about 200 miles. The depth

of the Amazon, from the sea to the mouth of the Rio Negro, is nowhere less than 30 fathoms, and in some places as great as 50; higher up it varies from 10 to 12; and as far as the junction of the Tunguragua with the Ucayale there is depth of water for vessels of almost every description. Beyond this only those drawing 5 or 6 feet can proceed with safety. The average velocity of the current is $2\frac{1}{2}$ miles per hour, though this speed is greatly exceeded above San Borja, where rapids interfere with the navigation. In the rainy season, when the waters rise 10 or 50 feet above their ordinary level, and consequently overflow their banks to a considerable extent, the rapidity of the stream is as great as 4 miles an hour. The upper part of the river is highest in January, the middle part in February, and the lower in March; the river is lowest in July and August. The tide flows up to Obidos, a distance of 400 miles from the mouth, and near full moon occasions the remarkable phenomenon known as the bore, by the natives called *pororoca*, when waves of 5 feet in height—sometimes, but rarely, of 15—rush up the channel with devastating violence. The river stream is distinctly traceable for a distance of 300 miles or more from its mouth, even as regards colour. A great perturbation arises, far out at sea from the meeting of the river with an ocean current which flows in a N.W. direction and crosses it almost at a right angle.

The country through which the Amazon flows is clad with lofty forest trees, the abode of many wild animals; while its waters yield an abundance of fish. Large turtles and alligators are found.

A great deal has been done in recent years to open up the vast, almost limitless, resources of the Amazon valley. A fleet of steamers now plies upon the river, and at various places of loading or unshipping towns are springing up, the chief of which is Para, the port of the Amazon, between which place and Santa, in Peru, vessels of 1000 tons constantly trade. Up the river, Manaus, at the junction of the Rio Negro, is the central point of operations. It may also be noted that sailing vessels have the advantage of an almost constant east trade wind, which enables them to make headway against the descending current. Steam communication is also established on the navigable Peruvian affluents of the Amazon, and on the portion of the main stream which flows through the territory of Peru, which drains a region rich to overflowing in valuable products. The virgin soil is capable of yielding every kind of tropical product in profuse abundance, and the wild forests already supply cinchona bark, caoutchouc, vanilla, sarsaparilla, timber of all kinds, and many other articles capable of being turned to account in trade. The valley is healthy, and could be made capable of supporting in comfort 20,000,000 of inhabitants.

Some explanation of the various names which this river bears will be interesting. The general title Amazon (also written Amazons or Amazonas), which by the natives is restricted to the portion below the Rio Negro, is derived from the Indian word *amasona*, meaning "boat-destroyer," from the destructive bore previously alluded to. Beyond, as far as the junction of the Ucayale and Marañon, it is known to the natives as Solimoes, supposed to be the designation of a tribe on its banks. The other names are those of explorers: Francisco d'Orellana, who sailed downwards from the Napo in 1540; and Marañon, who visited the upper portion in 1513. The honour of discovering the mouth of this river, however, is due to Vincent Yanez Pinçon, a captain who sailed with Columbus in his first voyage, and dates back to the year 1500. The entire length of the Amazon, from Lake Lauricocha, is reckoned at 2740 miles; or from the head-waters of the Ucayale, 3580. Thus it will be seen that in actual length it is shorter than the Mississippi, calculated to the source of

the Missouri. Drift-wood is carried down the stream in large quantities, as well as sometimes trees and portions of earth. The largest island at the mouth of the river, Marajo, is however not due to any alluvial deposits, but has probably been separated from the main land in consequence of some great inundation. It possesses navigable streams of its own, and is high in the interior. (See "Travels through the Amazon Valley," by Alfred R. Wallace; also works by W. H. Edwards and H. W. Bates.)

AMAZONS, a fabulous nation of female warriors. Their chief seat was Themiscyra, on the river Thermodon, near the modern Trebizond. Though the Amazons rejected the habitual fellowship of men, they did not neglect the care of continuing their race; but they only brought up female children, whom they educated in the arts of war, searing the right breast, that it might not interfere with the free use of the bow-arm. They are usually figured, in medallie and other representations, with a short mantle reaching to the knee, and the left breast bare. Their weapons were a crescent-shaped shield, bows and arrows, and the double-edged battle-axe. Diodorus and Q. Curtius state that Thalestris, queen of the Amazons, paid a visit to Alexander in Hyrcania; and Plutarch says that certain Amazons fought with the Albanians against Pompeius. The story of some Amazons being presented to Alexander is discussed by Arrian (vii. 13), and rejected; but Arrin believes that there was once a race of Amazons. The etymology of the word is uncertain. Some think it was derived from the Greek words *a*, no, *maza*, breast; others from *maza*, the men, which they are supposed to have worshipped. The myth probably arose from the vigor and bravery of the Caucasian women. The Amazons enter into many of the most famous classical myths. See BELLEROPHON, HERCULES, PHTHIS.

Amaré, who visited Abyssinia in 1520, speaks of a race of Amazons south of Danot, who fought with bows and arrows, mounted on bullocks. They destroyed the left breast when young. They lived with their husbands, but were governed only by a queen; the men had nothing to do with war. Pierre Petit has written a long book ("Traité Historique sur les Amazons") to prove that there were Amazons, to which most that is reported about them is collected. The most effective portion of the army of the King of Dahomey consists of several thousand female warriors, called "Amzons." See DANTOMY.

AMBALA or **UMBALLA**, a division, district, and city of British India, in the lieutenant-governorship of the Punjab.

AMBALA DIVISION embraces the three districts of Ambala, Ludhiana, and Simla. The area is 1007 square miles, and the population 1,700,000.

AMBALA DISTRICT lies between 29° 49' and 31° 12' N. lat., and between 76° 22' and 77° 39' E. lon., and has an area of 2627 square miles. It is bounded on the N. by the Saltoj, on the S. by the Karnal district and river Jumna, on the N.E. by the Himdayahs, and on the W. by Ludhiana district and the native state of Patiala. It consists almost entirely of a level plain, lying between the Saltoj and Jumna, and is well watered by numerous streams, the principal being the Ghaggar, which is nearly dried up in the hot season. The villages along its course are very unhealthy. The district, which is mostly agricultural, produces grain and rice, and has both a winter and summer harvest. The grand trunk road passes through the southern region, while the Sind, Punjab, and Delhi Rivers intersect it from S.E. to N.W. Ambala and the neighboring towns are intimately associated with the earliest dawn of Indian history. The strip of country between the Sarauti and the Ghaggar is the Holy Land of the Hindu faith, the sacred sanctity of the former river still attracts large numbers of pilgrims. Ambala was seized

by Ranjit Singh, but by the treaty of 1809 the British secured the Sikh princes from molestation. It was found necessary, however, in 1849, to deprive them of all sovereign power, and the district is now entirely under British control. The population in 1881 was 1,050,000.

AMBALA CITY, capital of the above district, is a large walled city, situated on an open plain 1040 feet above the sea, 3 miles E. of the river Ghaggar, 1020 N.W. of Calcutta, and 69 S.E. of Ludhiana. It was probably founded in the fourteenth century, by an Amba Rajput, from whom it takes its name, but was of little importance before the British occupation. The houses are of brick, but the streets are very narrow. Four miles S.E. of the city are the military station and cantonments, the church of which is considered the handsomest in the Punjab. Ambala is well situated for trade, and is also important as being the nearest railway station to the summer resort of the government at Simla. A grand durbar was held here in 1869 on the occasion of the visit of Shere Ali, ameer of Afghanistan, to Lord Mayo. The principal exports are cotton goods, grain, and carpets; and imports, English cloth and iron, salt, wool, and silk. The population of the city in 1881 was 50,000.

AMBASSADOR may be defined to be a person sent by one sovereign power to another to treat upon affairs of state.

Among the ordinary functions of an ambassador the following are the most important:—First, to conduct negotiations on behalf of his country. The extent of his authority in this respect is marked and limited by the power which he has received from home; he has, however, according to modern usage, no authority to conclude any engagement definitely, the treaty which he has negotiated having no binding power till it has been formally ratified by his government. Secondly, to watch over the accomplishment of all existing engagements. Thirdly, to take care generally that nothing is done within the territories of the state, nor any treaty entered into with other powers, by which the honour or interests of his country can be affected, without informing his government of such measures.

An ambassador has also certain duties to perform towards private individuals of his own nation, such as to provide them with passports where they are required; to present them at court, if they produce the requisite testimonials; to protect them from violence and injustice; and if any manifest wrong has been done, or if justice has been refused them, to exert himself to obtain redress, and to secure for them the full benefit of the laws; and lastly, to assist them in maintaining their rights in courts of justice, as well by certifying what is the law of his country upon the point in dispute as by the authentication of private documents, which is usually confined in practice to such as have been previously authenticated at the foreign office of his own government, and thence transmitted to him.

It is now the established usage of European countries and of America to send ambassadors to one another. The sending of an ambassador by any state implies that such state is also willing to receive one. Every state has the right, if it thinks fit, to object to any particular person being sent, and to refuse to receive him, or even to decline receiving an ambassador at all, though the refusal to receive an ambassador when properly accredited, without sufficient cause, is considered to be an insult to the power he represents. In most cases it is the custom to ascertain before sending an ambassador whether he will be acceptable to the government to whom he is sent.

It is the duty of a state, with respect to ambassadors sent to it, to protect them from everything which may in any degree interfere with the due performance of their functions. The first privilege of an ambassador in the

country to which he is sent, is perfect security. The second important privilege of an ambassador is, that no legal process can affect him in his person or his property. Ambassadors are, therefore, deemed not to be amenable for their conduct before any criminal tribunal of the country they reside in. The same principle also extends to civil suits, and no claim can be enforced against an ambassador by any compulsory process. These privileges are not confined to the ambassador alone, but are extended to all his suite. The law of nations in this respect is fully recognized by the law of England. By the statute of 7 Anne, c. 12, all legal process against the person or goods of an ambassador, or any of his domestic servants, is declared to be void. The third important privilege of an ambassador is, that his residence enjoys a security similar to that of his person and property; it is exempted from being searched or visited, whether by the police, revenue officers, or under colour of legal process of any description whatever. He can also import all foreign articles for his own consumption duty free. He is not, however, exempted from the payment of local rates—though, indeed, if he were to decline to pay them no process could issue against him for the purpose of levying them. He also pays the ordinary rates of postage, but he has the privilege of sending his own couriers carrying sealed despatches, which exempts him from the monopoly of the post office. These couriers and their despatches or mails are also regarded by common consent as inviolable messengers, unless they chance, in time of war, to fall into the hands of a hostile belligerent.

Another of the important privileges of an ambassador or envoy is the free exercise of the religion or form of worship to which he adheres; and although it is held by the best writers that he has not the right to maintain a chapel or chaplain under the law of nations, the use of ambassadors' chapels has now become general. The privilege had a real importance in those countries in which different forms of belief were not tolerated.

The great powers at the Congress of Vienna, in 1815, divided diplomatic agents into—1, ambassadors, legates, or nuncios; 2, envoys extraordinary and ministers plenipotentiary; 3, *chargés d'affaires*, accredited to the department of foreign affairs.

England has ambassadors at Paris, Constantinople, Vienna, St. Petersburg, Berlin, and Rome. The number of British ministers plenipotentiary and *chargés d'affaires* slightly vary, but is usually about twenty of the former and three or four of the latter. There are also ten ministers resident chiefly at the various South American states, whose duties are in every respect analogous to those of ambassadors or ministers plenipotentiary. See EMBASSY.

The functions of permanent ambassadors appear to have originated in modern times. The ambassadors (*αρετοβουρ*) sent by the Greek states and those sent by the Romans (*legati*), or received by them, were limited to extraordinary occasions. Among the Romans ambassadors were often sent by foreign nations to them, and sent by the Romans to foreign states, and the law with respect to them ("Jus Legationis," Livy vi. 17) became in course of time well settled. Ambassadors to Rome were under the protection of the state, whether they came from a hostile or a friendly nation. They were received by the Roman senate, and transacted their business with that body. The senate appointed the ambassadors who were sent from Rome to foreign states. The expenses of such ambassadors were paid by the Roman state, but the ambassadors were also entitled to make certain demands from the provincials in their progress through a Roman province.

AMBER (or **UMBER**, according to Bishop Heber), a ruined town in Jaipur state, British India, about 4 miles N.E. of the town of Jaipur, was formerly the

capital. When the Rajah Jai Singh built Jaipur and made it his capital, in 1728, Amber fell into decay. The ruins of the town, overgrown with trees and underwood, and intermingled with towers and temples, are situated in a valley on the margin of a small lake. The town is overlooked by an old fortified palace, which is connected by a long line of unbattled wall with a very large castle on the top of the hill. The palace, commenced about 1600, and still in a good state of repair though uninhabited, is approached by a broad and long flight of steps, and the entrance is through a richly ornamented gateway. Bishop Heber says that the interior courts of the palace contain one very noble hall of audience, a pretty little garden with fountains, and a long succession of passages, cloisters, alcoves, and small and intricate apartments, many of them extremely beautiful, and affording from their windows, balconies, and terraces one of the most striking prospects which can be conceived. The carving in stone and marble, and the inlaid flowers and ornaments of the apartments are equal to those at Delhi and Agra, and only surpassed by the beauties of the Taj Mahal. [See AGRA.] There is a large quantity of stained glass in the windows in a good state of preservation. This palace, as well as that at Jaipur, was the work of Jai Singh. The castle on the top of the hill is very strong, with high towers and machicolated battlements, and was said, when Bishop Heber was there, to contain many state prisoners. He was not permitted to see the interior. (Heber's "Journey through the Upper Provinces of India,"ergusson's "History of Eastern Architecture" 1867.)

AMBER, a mineral, which occurs in beds of lignite in Greenland, Prussia, France, Switzerland, and some other countries. The greater portion of it comes from the southern coasts of the Baltic Sea, where it is thrown up between Königsberg and Memel. It is also obtained by mining at a distance of 200 feet from the sea, and at a depth of about 100 feet, and is found in small cavities. It is occasionally met with in the gravel beds near London, in which case it is merely an alluvial product. Amber occurs generally in small pieces, which are sometimes colorless, frequently light yellow, or deep brown, and very commonly translucent. Two large masses have, however, been found, one of them weighing upwards of 13 lbs., and the other more than 18. The value of the former was estimated at £1,500. A good specimen weighing 1 lb. is worth about £8.

Amber is rather harder than common resins, which it resembles in several properties. It is susceptible of a good polish, and when rubbed becomes electrical; indeed, the word *electricity* is derived from *ἤλεκτρον*, the Greek name for amber. Its specific gravity is 1.08. When bruised it exhales a slight aromatic odour; and when heated to 418° Fahr. it melts, then burns with a bright light, leaving a black residue used in making a superior varnish. It consists of carbon, 79; hydrogen, 10.5; and oxygen, 10.5.

The subject of the origin of amber has been much discussed, but it is now generally agreed that it is the mineralized resin of an extinct tree similar to a pine, which grew in great abundance in northern Europe, and stretched as far south as the Mediterranean. Although these firs or pines became extinct at a period far anterior to all historical time, it is certain that they lived in a later age, and were of a higher organization than the giant forms of the semi-tropical carboniferous era, which were prototypes of the cypress trees still existing in eastern North America. Professor Zaddach says the amber-producing trees must have grown on green-sand beds of cretaceous soil forming the shores of estuaries. And it is not only to these prehistoric forests that amber bears witness; for in this resin, fossilized by centuries of time, have been discovered nearly

800 different species of insects, mostly now extinct; and many specimens of the flora of that period, embalmed whilst still a living vegetation, which differ entirely from the fossil plants supplied by the brown coal-beds resting immediately above. Amber consists of a mixture of several substances, which are, a volatile oil, two resins soluble in alcohol and in ether, succinic acid, and a bituminous body that resists the action of all solvents, and which is the principal part of amber. Schroetter and Forehammer find that amber deprived by ether of its soluble constituents has the composition of camphor ($C_{10}H_{16}O$). Water does not act upon this substance; it does not even dissolve any of the succinic acid. Alcohol when highly rectified extracts its coloring matter. It is soluble in sulphuric acid, but is reprecipitated on addition of water. Pure alkalis dissolve it. When heated amber fuses and gives off succinic acid, water, oil, and a combustible gas. The residue is termed *colophony of amber*. This when heated yields a colourless oil, which is known in pharmacy under the name of oil of amber, and is used as an antidote for the bites of poisonous animals.

Amber is employed in the manufacture of necklaces, mouthpieces of pipes, and other ornaments. It was curiously intermingled with the myths and legends of the ancient Greeks, and was largely used in the adornments of their temples, being laid with other precious things upon the sacred dais, where oil-cerasty gifts were thought acceptable to the gods. According to Herodotus, one of the gates of Thebes was made of amber. Even in the British barrows, amber beads have been found along with pierced stone axes, arrow-heads, and other buried treasures.

AMBERG, a well built walled town on the river Vils, in Bavaria, in the Upper Palatinate of which it was formerly the capital, about 40 miles E. of Nuremberg. Its public edifices consist of the Church of St. Martin, which is decorated with several fine monuments, a college, arsenal, and a hall, house of correction, lyceum, high school, library, and cabinet of natural history. It has a small-arms factory, employing upwards of 800 men, besides manufactures of earthenware, woollen cloth, salt, and beer. There are considerable iron mines in the neighbourhood. The Austrians gained a victory over the French near here in 1796. The population in 1882 was 11,583.

AMBERGRIS (*gray amber*), a substance of animal origin found principally in warm climates, floating on the sea, or thrown on the coasts of Madagascar, Surinam, and Java. It has been found in the intestinal canal of the *Phoxinus phoxinus*, mixed with the remains of several marine animals which have served it for food. On this account it has been supposed to be a morbid product, analogous to biliary calculi.

Ambergris of good quality is solid, opaque, of a bright gray colour, which is darkest externally, and intermixed with yellow or reddish striae. When it is heated or rubbed it emits an odour which is agreeable to most persons. It is generally brittle, but when rubbed becomes smooth like wax, and sufficiently soft to be flattened between the fingers. Its specific gravity varies from 0.789 to 0.926. When ambergris is heated with boiling alcohol, a peculiar substance, called *ambrein*, is obtained as the solution cools, grouped in small colourless crystals. Ambrein has an agreeable odour. When heated upon platinum foil it fuses, smokes, and is volatilized. It is very soluble in strong alcohol, in ether, and in oils both fixed and volatile. Nitric acid converts it into *ambrie acid*. Ambreïn appears to be composed of ambrein, with traces of carbonate and phosphate of calcium, ferric oxide, and alkaline chlorides, soluble in alcohol, and probably containing benzoic acid, 0.025; watery extract with benzoic acid and common salt, 0.015; with 0.11 not accounted for.

AMBERT, a town of France, in the department of Puy-de-Dôme, and capital of the arrondissement Ambert, situated at the foot of a ridge of hills in the fertile valley of the Dore, 35 miles S.E. from Clermont. It has civil and commercial tribunals, and a college. The houses of the town are in general well built, but the streets are narrow and crooked. The granite Church of St. Jean, surmounted by its lofty spire, is the most remarkable structure. Woollen cloth, blankets, laces, garters, serge, ribbons, linen, pins, tape, woollen yarn, and a large quantity of printing and engraving paper are manufactured. The town has some mineral springs, and the cheese of the neighbourhood is much esteemed. Population, 8000.

AMBLESIDE, a market town and chapelry in the parish of Grassmere, Westmoreland, 11 miles N.W. of Kendal, and 266 from London, being 5 miles from the Windermere station of the London and North western Railway. It lies in a beautiful valley near the northern extremity of the Lake of Windermere, on the little streamlet Rothay or Rakebeck. It is laid out in a rambling irregular manner, which, however, combines with the peculiarities of its situation to impart to it a highly picturesque character. In the immediate vicinity many handsome villas and houses are situated, each in its own breadth of "blooming garden-ground." The chapel, in the highest part of the town, is a plain but commodious building. The district church contains a memorial window to the poet Wordsworth, whose former residence at Rydal Mount is in the neighbourhood. There is a town-hall, also a free school, founded in 1721. Ambleside is a place of considerable resort for visitors to the lakes of Cumberland and Westmoreland, and has some good inns. There are traces of Roman fortifications still existing, and coins are sometimes found. There are copper and lead mines in the vicinity, and a slate quarry. The population of the parish in 1881 was 1989.

AMBLYOP'SIS SPELÆUS is the renowned blind-fish of the Mammoth Cave in Kentucky. It occurs in all the subterranean rivers of the limestone region in the centre of the United States. To make up for the loss of sight, two other senses, hearing and touch, are very highly developed. Ridges run across the head provided with a large number of *tactile papillæ*, thus forming, like the finger-end or tongue in man, very delicate organs of touch. D. Wyman examined fourteen of these fishes, and in three or four of them only was he able to detect an eye-ball beneath the skin. These he dissected, and found that the eye was wholly covered by areolar tissue, and was not organized to receive images of external objects. Slender optic nerves were detected, but he could not trace them to the optic lobes of the brain. The optic lobes are as well developed as in other fish, pointing to some long anterior period when the eyes were there to receive impressions for the information of the brain. This fish is one of those which bring forth their young alive. As might have been expected, it is colourless. It belongs to the order *PHYNOTOMI*.

AMBLYSTOMA. See *AXOLOTL*.

AMBO, the raised platform in Eastern churches on which singers mounted when they sang. The Council of Laodicea (360-370), in view of the disorderly singing of the time, prohibited all congregational singing, and limited church music to that "from the ambo," that is, to the regular choir only.

The term is also used in general for a church desk or pulpit, if in the choir.

AMBOISE, a town in France, in the department of Indre-et-Loire, 15 miles E. of Tours, stands on the left bank of the Loire, which is here crossed by a fine bridge. The town is situated in a wine district, which from its richness has been called "the garden of France." It has

some manufactures of steel goods, files, and woollens. There is an ancient castle in Amboise, which was formerly the residence of several of the kings of France, and of the Arab chief Abd-el-Kader during his long captivity. Charles VIII. was born and died here. When it became the property of Louis Philippe he made great improvements in it, and restored the chapel, which stands in the gardens, and is a fine specimen of the florid Gothic style. The civil wars on account of religion broke out in Amboise in the sixteenth century, and here also the epithet "Huguenots" was first applied to the Calvinists in 1560, when 1200 of them were massacred on the discovery of their plot against the Guises. The population in 1882 was 4500.

AMBOISE, CARDINAL GEORGE D', an eminent French ecclesiastic and statesman. He was born in 1460, and being the younger son of an illustrious family, was educated for the church. He was made bishop of Montauban in 1474, at the age of fourteen, and subsequently became archbishop of Narbonne, which he exchanged in 1493 for the archbishopric of Rouen. In that year he also became the principal minister of Louis XII., and exercised a great influence over both the foreign policy and home affairs of France. He displayed great financial and administrative ability, and introduced reforms in both legal and ecclesiastical affairs. He aspired to the Papal chair in 1503, and failing to obtain election became the determined enemy of the pope, Julius II. He even encouraged a division between the French Church and the see of Rome; but his plans failed, and he died seven years later, at Lyons, on the 25th May, 1510. He was buried in the cathedral of Rouen, where his tomb is still preserved. He was faithful to his order, devoted to his country, and loyal to his sovereign, and he was undoubtedly a great benefactor to France. On the other hand, he has been accused of ambition, pride, and avarice; and it was alleged that his vast fortune was acquired in an unscrupulous manner. The letters of Louis XII. and Amboise were printed at Brussels in 1712; and biographies of Amboise were published at Rouen in 1721, and by Vitruac in 1806.

AMBOYNA, one of the Molucca or Spice Islands, on the E. of Borneo and Celebes, lies in 30° 41' S. lat. and 128° 10' E. lon. It is 32 miles long by about 10 broad, and is nearly cut in two by a deeply indented bay. Attempts have been made to carry a canal across the intervening isthmus, which is only a mile broad. The northern part, which is known as Hitoe, is the larger, while the other has the name of Leitimor.

Amboyna is mountainous, but abundantly furnished with trees and underwood, and is, generally speaking, well watered and fertile. The soil is for the most part a reddish clay; in the valleys it is of a darker colour, and mixed with sand. Sulphur is produced among the hills, some of which are incrustated with a copious efflorescence of that mineral. The island is considered healthy, notwithstanding the great heat of the climate. Earthquakes and hurricanes are prevalent, and after the eastern monsoons the rainfall is copious. It is remarkable that eastward of 120° E. lon. the monsoons are directly the reverse of those experienced westward of that line, so that the weather at and near Amboyna differs much from that of regions not far distant from it.

The earliest visit made to Amboyna by any Europeans was in 1511, when the Portuguese traded to and afterwards took possession of it. They held it till driven out by the Dutch in 1607. In 1612 the English East India Company founded a settlement, but it was uprooted by the Dutch with great cruelty in 1622. Cromwell exacted due retribution many years afterwards; but from that time to the present, except for a short period, the island has belonged to the Dutch.

The main object of the different European powers who endeavoured to possess themselves of Amboyna was to monopolize the trade in cloves, the cultivation of which spice forms the principal object of industry. With the desire of keeping the cultivation of the clove-tree completely within their power, the Dutch for many years caused it to be extirpated from every island belonging to them except Amboyna, where they provided for a sufficient production of the spice by obliging every native family to rear a certain number of clove-trees. In the prosecution of their plans the island was divided into 4000 allotments, each one of which was expected to support 125 trees, and a law was passed in 1720 rendering it compulsory upon the natives to make up the full complement. The present annual produce of cloves varies considerably, but averages 500,000 lbs.—each tree yielding from 2 to 5 lbs. Amboyna also produces most of the plants found in the neighbouring regions.

Animals and birds are not numerous, but the insect kingdom is very rich. The aborigines of the island are called Horaforas, but the bulk of the population, which is mostly Christian, consists of Malays, with some Dutch residents. The number of inhabitants on the island is about 50,000.

AMBOYNA, the capital, and chief town of the Dutch Moluccas, lies on the S.W. shore of Lontunor. The streets are wide, and the houses, which are of wood, except those of the European residents, are mostly of one story. There is a fort and good harbour; also two Protestant churches and a hospital. The population is about 13,000. See **MOLUCCAS**.

AMBOYNA WOOD is obtained from the stem of a tree, *Pterospermum indicum*, belonging to the order STERCULIACEÆ. It is a very handsome mottled wood.

AMBROS, AUGUST W., professor of the history of music at Prague, the most learned of the modern historians of music. It is to be deeply regretted that he was only able to reach the fourth volume (*Palestrina and his times*) of his great work, "*Geschichte der Musik*," which is as admirable in style as it is profound in research. He was born in a little village of Bohemia in 1816, and died at Prague, 1876. His musical compositions, vocal and instrumental, are of the romantic school, and of great merit.

AMBROSE, SAINT, was born about the year 340. His father held the high office of prætorian prefect of Gaul, and in this province Ambrose was born, probably at Treves. He was educated at Rome under the ablest masters, and having acquired some distinction as a lawyer, was appointed governor of Liguria. Thus situated, he had reached his thirty-fourth year when an incident happened which suddenly changed the entire course of his life. In A.D. 374 Auxentius, the archbishop of Milan, died, on which a violent contest immediately arose as to the appointment of his successor, between the two great parties in the church, the Catholics and the Arians. On the day when the election was to take place the party feeling was so violent that Ambrose was induced to try his influence with the people; and accordingly he addressed them in a conciliatory speech. The assembly came to a unanimous resolution that Ambrose himself should be placed in the vacant office, although he professed the utmost reluctance to accept the episcopal dignity. He was, however, at last prevailed upon, by the express command of the emperor, to mount the archiepiscopal throne. Although he had been educated in the Christian religion, his baptism had never yet taken place, and he was actually consecrated on the eighth day after having received that rite.

The extraordinary piety and zeal of the new archbishop soon rendered him the wonder of the church. But in addition to his pastoral and other sacred labours, Ambrose acted a distinguished part in the political affairs of his

time. While he lived he was consulted on all great emergencies, both by Theodosius, the emperor of the East, by Valentinian II., the Western emperor, and even by the mother of the latter, the Empress Justina, notwithstanding her attachment to the Arian doctrine, of which Ambrose was the most determined opponent. The empress was particularly anxious that Ambrose should resign two, or at least one, of the Milan churches to the use of the Arians; but this demand the bishop pertinaciously resisted; and as he was supported in his opposition by the people Justina soon gave up the contest. It was, according to one account, upon obtaining this triumph, that St. Ambrose composed the celebrated hymn of thanksgiving, the "Te Deum Laudamus," which has long formed a remarkable part of the service of the Roman Church, and has also been retained in the Church of England liturgy; but it is now allowed by the Roman Catholic critics themselves that the "Te Deum Laudamus" is of an age considerably later than that of Ambrose.

Theodosius, the emperor of the East, was one of the most reverent admirers of the Archbishop of Milan; but when in 390 Theodosius, carried away by a blind passion, barbarously gave orders for a general massacre of the inhabitants of Thessalonica, by way of punishment for an outrage committed by a few individuals, Ambrose expressed in severe terms to the imperial criminal his abhorrence of so inhuman an act; nor would he again admit him to the communion of the faithful until he had been subjected to an exclusion of eight months' duration, and had publicly performed penance, in the guise and attitude of a suppliant, in the great church of Milan. Ambrose died at Milan on the 3rd of April, 397; and the great church, from its being made the depository of his body, received the name of the Basilica Ambrosiana.

The best edition of the works of St. Ambrose is that published in two volumes folio, Paris, 1686 and 1690, by the Benedictine monks. His "Offices" and several of his other pieces have been translated into English, and there are also French translations of some of them.

In addition to his character as an ecclesiastic, St. Ambrose claims earnest attention as the first reformer of Christian church music. In the beginning of the fourth century Pope Sylvester had set up a singing school at Rome, but we know by the decree of the Council of Laodicea (see AMOÏ) that its effects had at all events not penetrated beyond the clergy. Out of the confusion of the music of the time, the ancient Greek systems being lost as a whole, and probably only the Common Mode, or Hypodorian Mode, remaining in use (that is, our scale of A major, all white notes), St. Ambrose is traditionally said to have constructed four *tones*, after the number of the evangelists, in one or other of which he arranged all the music he required for Milan. These *tones* of St. Ambrose (as described to him) are simply octaves of the Greek Hypodorian scale. This was one of the fifteen Greek scales all constructed after the same pattern, beginning with *do* on scales *do*, on different key-notes. The Ambrosian *tones*, however, were simply fragments of the *same* scale made to begin on different notes, and consequently no two were alike in the relation of their notes to the principals. St. Ambrose selected *d, e, f, g* as his principals; and if the *plane forte* be referred to, and octaves of white notes be played from each of these, it may be found that the first *tone* has a semitone between the first and second notes; the second *tone*, between the first and second notes; the third *tone*, between the fourth and fifth notes; and the fourth *tone*, between the third and fourth notes. The important results following from this extraordinary re-modelling of the musical system will be found described under *MODES, ECCLESIASTICAL*.

St. Ambrose, as is shown above, chose scales (or parts

of scales) lying well within the usual voices of men, and so insured harmoniousness for his music; but he did yet more, he also introduced antiphonal singing, or singing by two choirs taking verse and response alternately, according to the ancient Hebrew method of chanting, and thus in the simplest manner he gained variety.

He collected a large mass of music, and we have the touching record of his friend St. Augustine (himself skilled in music) as to the marvellous results produced by the hitherto unheard effects now achieved at Milan. "How did I weep in thy hymns and canticles," says St. Augustine in his "Confessions," "touched to the quick by the voices of thy sweet attuned church! The voices flowed into mine ears, and the truth distilled into mine heart, whence the affections of my devotions overflowed, and tears ran down, and happy was I therein."

There are fragments of music preserved by Fétis and others as being Ambrosian, but they are of such very doubtful authenticity that it is necessary only thus to refer to them. It seems quite certain, however, that St. Ambrose insisted upon "quantity" (the nearest approach to which is our modern accent) being well observed; and it is hard to conceive how the timeless music of later centuries can have arisen when once men had tasted the sweets of rhythm. But the whole work of St. Ambrose was in complete decay by the time of Gregory the Great, for an account of whose revival and extension of the Ambrosian musical system see *MODES, ECCLESIASTICAL*.

AMBROSIA, in Greek and Roman mythology, was the name of the food of the gods, and was supposed to confer immortality on all who partook of it. It was represented as being sweeter than honey, and of a delicious colour. The Sanskrit *a-mrita*, or elixir of life, has the same meaning.

AMBROSIAN LIBRARY. See *MILAN*.

AMBULANCE (a French word, from the Latin *ambulare*, to walk) is the name given on the Continent to a field hospital attached to an army, and moving with it. In England the name is also used to designate the waggons, carts, and other modes of conveyance by which the wounded are removed from the field. The first ambulance train was devised by Baron Larrey, an eminent French surgeon, in 1792, and it received the warm support of Napoleon. It was rendered more effective by the labours of another distinguished surgeon, Baron Percy, who introduced a regular corps of bearers, and it has now become a recognized institution in all European armies. The arrangements vary somewhat in details, but they generally include a staff of bearers, whose duty it is to follow the combatants, and if possible carry the wounded to the rear; a surgical staff, including the medical officers, dressers, nurses, cooks, and attendants, and an ambulance train, upon whom devolve the duties of transporting the wounded from the field stations to the more permanent hospitals, and the conveyance of the needful medical stores.

The most complete and perfect arrangements are those of the German army, where the whole system has been thoroughly organized down to its smallest details. The arrangements of the British army in this matter, though far in advance of the miserable mismanagement which prevailed during the war in the Crimea, are still admittedly imperfect in many respects.

The St. John's Ambulance Association was established in 1877, with the view of disseminating practical information respecting first aid to sufferers from accidents, and to register the names of persons qualified to act as nurses in time of war. Upwards of a hundred centres have been established in Great Britain, and instruction is now given regularly in a large number of classes.

AMBULATORY, in architecture, the space inclosed by a colonnade or an arcade. In the peripteral temple of

the Greeks, the lateral or flanking porticoes are properly termed ambulatories; the cloister of a monastery is surrounded by an ambulatory or ambulatories.

The aisles of the ancient Basilica, and those of the cathedral, or other large church, are sometimes called ambulatories.

AMBUSCADE, a military term, derived from the Italian *imboscata*, something hidden in a wood, and applied to a body of troops disposed so that they may make an unexpected attack on an enemy. In ancient times such attacks were frequent, and generally successful, and they are still so among savage nations; but the vigilance with which the ground about an army, or a column on the march, is now reconnoitred, renders them impossible in modern warfare, or limits them to attempts by small bodies of men to intercept convoys or foraging parties which are not well protected.

A'MELAND, a small island belonging to the Dutch province of Friesland. It is separated from the mainland by a channel called the Watt, and is about 12 miles long and 2 broad. It contains three villages and some good pasture land. Some of the inhabitants make lime of the sea-shells found on the coast, and many of them are fishermen. They are a handsome race, and the women are said to be the finest-looking in Holland. The population, half of whom are Baptists, numbers 2500.

AMEN, a Hebrew word, properly signifying "firmness," and hence "truth," which has been adopted without alteration in various languages. Its most frequent use is at the conclusion of prayers, thanksgivings, and denunciations, where it is understood to express belief, assent, and concurrence in what has been expressed. Examples of its use in all these cases are numerous in the Old Testament. The word "amen" concludes all the gospels, and almost all the epistles. "Amen" is often used by Christ at the beginning of a discourse, as an impressive particle, which in our version is rendered "verily."

AMENDE HONORABLE. According to the old laws of France, persons guilty of crimes coming under the head of public scandals, were often sentenced to make a public confession of their guilt, which was called making the "amende honorable." This was accounted an infamous punishment. The courts also might order a person by whom the reputation or honour of another had been injured to make a public acknowledgment of the wrong; and such a sentence carried no infamy with it. It is from this latter custom that the modern and popular use of the expression has been borrowed, according to which we say that a person makes the "amende honorable" when he publicly admits any wrong which he feels that he has done to another person.

AMENDMENT is a term used both in legal and parliamentary proceedings. In law it implies the correction of errors and mistakes in the pleadings or written records of judicial proceedings of courts of law. In former times it was a legal maxim that after proceedings were once entered on record, the judges had no power to alter them in any respect, however trifling. The consequence was that after a suit was decided in favour of a party, it frequently happened that his adversary discovered some blunder made by the officer of the court in making up the record, and by bringing a writ of error he deprived the successful party of all benefit from the judgment he had obtained. This rule was of necessity the cause of much injustice and great inconvenience; but though various efforts were made to abolish it the legal profession, to whom it was very profitable, contrived to retain it to a considerable extent until a comparatively recent period. Important improvements upon this practice were introduced by the statutes 7 Geo. IV. c. 64, s. 19, and 9 Geo. IV. c. 15, and further advances were made by 384 Will. IV. c. 42; but all former powers of amendment have been far exceeded by

the very enlarged scope of the Common Law Procedure Acts of 1852-54, which not only enable amendments to be made, but require the judge to make such amendments as shall be necessary, so that the real question at issue between the litigants should be tried, and false niceties in special pleading be abolished.

In parliament the term amendment is used when it is intended to propose any alteration in the draft of a bill or the terms of a motion. By the rules of the House of Commons no member, except when the House is in Committee, is allowed to speak more than once on the same question, but he may speak again on an amendment. When an amendment has been proposed and seconded, and duly discussed, it is the custom of the House to vote upon the original motion first, which is put from the chair thus: "That the words proposed to be left out stand part of the question." If this be carried the main question is then put. But if the question be negatived the motion is put, with the omission of the words referred to. The term is also used as a polite means of dismissing a bill from any further consideration, by moving as an amendment that instead of now the bill be read this day six months.

AMENTACEÆ, a name sometimes given to a number of forest trees found chiefly in the north of Europe, Asia, and America, the flowers of which are arranged in a dense, cylindrical, deciduous spike, called by botanists an *amentum*. Such are the poplar, the birch, the hazel, the willow, the oak, and many others. But as their genera are in fact constructed in very different manners, Amentaceæ are more correctly separated by modern botanists into several different orders, for which see CUPULIFERÆ, SALICACEÆ, MYRICACEÆ, and CASCARINACEÆ.

AMEN'TUM is a drooping spike of unisexual apetalous flowers which falls away after flowering or fruiting. It occurs in such plants as the willow, hazel, and oak. It is commonly called a *catkin*.

AMERICA. We shall here only take a general survey of the discovery and settlement of the great western continent, or New World, leaving a description of its physical features for the articles NORTH AMERICA and SOUTH AMERICA, and dealing with the moral and political relations of its countries in the articles specially devoted to them.

Various traditions and allusions made by the early Icelandic authors, led to an opinion that America was known to Europeans as far back as five centuries before the time of Columbus. The Royal Society of Northern Antiquaries at Copenhagen commenced a search among Danish, Norwegian, and Icelandic manuscripts; and the result, published in 1837, left no doubt that the Scandinavians knew and visited the coast of America above eight centuries ago. Biance Heriulfson made a voyage from Iceland to Greenland in 986. Leif Eriksen and Tyrkes voyaged along the same coast in the year 1000. Thorwald Eriksen extended these researches in 1002. Three vessels, commanded by Thorfinn, were engaged in exploring along the coast from 1007 to 1010; and a year afterwards another expedition sailed from Iceland to America. There seems also evidence that about the same time the natives of the Orkneys and of Ireland had made settlements on the coast of America further to the south. By the year 1266 we find that the Danes, settled peaceably at Greenland, voyaged from thence as far north as 75° N. lat., near the spot now called Barrow Strait. In 1285 Newfoundland was visited by two Icelandic missionaries, Odalbrand and Thorwald Helgason. All these points are now based on tolerably sure ground, and are evidence that the Scandinavians visited America long before Columbus—a fact, however, which was not known to Columbus or any of his contemporaries.

During the latter part of the fifteenth century there was an ardent spirit of discovery in Europe, the principal object

of which was to find a passage by sea to the East Indies. In this state of things a project was formed by Christopher Colomb, or Columbus, a citizen of Genoa, to sail westward to the Indies—an idea which shows Columbus' knowledge of the figure of the earth to have been superior to the general notions of his age. For a notice of the difficulties he underwent we refer to COLUMBUS. In his first expedition, made in 1492, he discovered San Salvador, Cuba, Hayti, and other islands of the West Indies, which he so named in ignorance that the vast Pacific intervened between them and India proper. In the next expedition Columbus discovered Jamaica. In a third his discoveries included Trinidad and the coast of South America near the Orinoco. The success of Columbus soon gave encouragement to private adventurers to the new world, one of the first of whom was Alonso de Ojeda, who in 1499 followed the course of Columbus to the coast of Paria, and, standing to the west, voyaged along a considerable extent of coast beyond that on which Columbus had touched, and thus ascertained that this country was part of the continent. Amerigo Vesputi, a Florentine gentleman, accompanied Ojeda in this voyage, and having on his return been the first to publish an account of the wonderful discoveries, the country of which he was supposed to be the discoverer came gradually to be called by his name, and by universal usage the name of *America* has been bestowed on this new division of the globe. It is now too late to redress the injustice which has received the sanction of time.

In 1497, while Columbus was engaged in his researches, the coast of North America had been reached by an English vessel, commanded by Giovanni Caboto, or Cabot, a Venetian settled in Bristol, who undertook an expedition in company with his son Sebastian, and explored a long line of the North American coast. [See CABOT.] In 1498 Sebastian Cabot, in another expedition, visited Newfoundland. In 1500 Gaspar Corte Real, a Portuguese, touched at Labrador; and Brazil was accidentally discovered by a Portuguese fleet under Cabral. The coast of the province of Tierra Firme, from Cape de Vela to the Gulf of Darien, was first visited by Bastidas, a Spaniard, in 1501. Yucatan was discovered by Diaz de Solis and Pinzon in 1508, and Florida by Ponce de Leon in 1512. On the peninsula of Florida—so called on account of its luxuriant vegetation—the Spaniards, in 1512, founded the first European settlement on the American mainland. In the same year Sebastian Cabot reached the bay since called Hudson's Bay. The Pacific of Southern Ocean was first seen from the mountain tops near Panama by Balboa in 1513, and two years after a landing was effected on the south-east coast of South America, about the mouth of the Rio de la Plata, by De Solis, who, as well as several of his crew, were killed, roasted, and eaten by the natives in sight of their comrades in the boats. The Spanish government, which had been foremost in discovery, was the first also to make conquests in America, only in the sixteenth century. Fernando Cortez was despatched to subdue Mexico, the most powerful state in the new continent. Notwithstanding the efforts of its chief, Montezuma, it soon fell under the domination of Spain, and this conquest was followed by another almost equally valuable—that of Peru, whose submission to the Spanish yoke was effected by Pizarro.

The real longitudinal extent of the New World was not determined until some 250 years after its discovery by Columbus. The southern extremity was first rounded in 1520 by Ferdinand Magellan, who made his way to the Pacific sea by sailing round the continent at its southern extremity through the strait separating the mainland of South America from the island of Tierra del Fuego. The strait thus discovered by him was long regarded as the only means of access to Chili, Peru, and the other western lands found by the Spaniards to be so wonderfully

prolific in silver and gold. Spain had become intoxicated with the dream of wealth opened up by the discoveries of her navigators, and gave the name of "El Dorado" (literally, "the golden country") to a region said to be situated in the interior of South America, between the Orinoco and the Amazon, where gold and precious stones were supposed to be in such abundance as to be had for merely picking them up. The story was communicated by an Indian captive to Gonzalo Pizarro, brother of the conqueror, who sent Francisco Orellana down the Amazon river to discover this wonderful land. Orellana followed the course of the Amazon down to the sea, but did not find El Dorado. The nearest approach to the reality was made by the almost fabulously wealthy districts of Peru and the adjacent countries on the western coast; and the richly-laden cargoes sent home from thence to Spain intensely excited the avarice and cupidity of the nation which now claimed the New World as exclusively its own. Jealous, therefore, lest other galleons than their own should make for the western lands to obtain a share in their precious treasures, the Spaniards circulated a rumour that the Strait of Magellan had been closed by a convulsion of nature. Their principal communications with Europe were then made by way of vessels from the Isthmus of Darien, which, appropriated as Spanish territory, was thought to be more easily protected from intrusion. At Plymouth, however, there lived a certain Francis Drake, who by industry had acquired a small barque of his own, and made some trading ventures in it with profit, while gaining reputation for skill and courage. But he lost his all by a treacherous attack of the Spaniards when with Sir John Hawkins in the West Indies, and thereforth deemed it right, whenever practicable, to compensate himself by making reprisals, without caring to inquire when the precise equivalent had been exacted. According to the maritime logic, or "sea divinity" of the age, nothing could be clearer than his case, as quaintly expounded by a contemporary: that whereas the "King of Spain's subjects had undone Mr. Drake, therefore Mr. Drake was entitled to take the best satisfaction he could of the subjects of the King of Spain." He faithfully acted upon the maxim—

"That they should take who have the power,
And they should keep who can."

Enabled by friends to equip two vessels, Drake sailed to Darien, and having moored and concealed his ships he marched across the isthmus with a number of his men and some Indians. It was his object to intercept Spanish treasure, which was then conveyed by mules from Panama to the Atlantic coast for shipment to Europe. During the excursion an interesting incident occurred which determined much of his future course. Upon arriving at a certain hill the chief of the Indians took him by the hand, and led him to the summit. Here was "a goodly and great high tree," in which steps had been cut to ascend near the top, where a convenient bower had been constructed, capable of accommodating ten or twelve men seated. It commanded a view of two oceans—the Atlantic on the one hand and the Pacific on the other. The trees had been felled in the neighbourhood to make the prospect clearer. "After our captain had ascended to this bower," says the narrator, "and having, as it pleased God at this time by reason of the breeze, a very fair day, had seen that sea of which he had heard such golden reports, he besought of Almighty God of his goodness to give him life and leave to sail once in an English ship in that sea; and then calling up all the rest of our men, acquainted John Oxenham especially with this his petition and purpose, if it should please God to give him that happiness."

Having relieved a file of treasure-mules of their burden, Drake returned home with large booty, and reached Plymouth on the 9th of August, 1578. This was a Sunday.

News of his arrival being carried to church, "there remained few or no people with the preacher," as the congregation broke up to welcome the seamen.

Drake's thoughts were now intently fixed upon sailing on the ocean at which he had glanced, and he succeeded in so far interesting his countrymen in the project that five vessels were at length placed at his disposal, with which to disturb the repose of the Spaniards in the Pacific Ocean. But it was necessary to proceed with caution, as peace nominally subsisted between the two nations. The object of the expedition was of course carefully concealed. Its destination was also falsely indicated, and while Queen Elizabeth secretly approved of the scheme, she gave no open sanction to it. The squadron sailed from Plymouth on the 13th December, 1577.

In spite of the alleged "convulsion of nature" said to have closed the Strait of Magellan, Drake effected its passage in seventeen days, and then sailing along the coasts of Chili and Peru the settlements of the Spaniards were touched at, and keenly scrutinized with an eye to what was valuable. They were then in their infancy. Arica contained little more than twenty houses, and Valparaiso numbered about a dozen families. But near the latter port a large ship was plundered of many jars of

Chili wine, jewels, and merchandise, with 60,000 pesos of gold, worth about £24,000. On landing occasionally for water and other stores, wealth was unexpectedly acquired. Thus a Spaniard was found asleep with silver bars lying beside him, equal in value to 4000 ducats; and on another occasion eight llamas were met with in charge of a guide, each carrying 100 lbs. of silver. Drake's richest prize, however, was a treasure-ship bound for Panama, from which he obtained 26 tons of silver bullion, thirteen chests of ryals of plate, 80 lbs. of gold, the whole estimated at 360,000 pesos, equal to nearly £150,000. Nothing could exceed the astonishment of the Spaniards at finding the English in waters which they regarded as peculiarly their own; while, not expecting an enemy, they were not prepared to meet one, and became an easy prey to the daring visitor.

Satisfied with spoil, Drake became anxious to secure it by a speedy passage home. But he did not like to retrace his route, lest the Spaniards should have prepared themselves to intercept him. To avoid this consequence he sailed to the north on a voyage of discovery, hoping to find in that direction a channel corresponding to the Strait of Magellan in the south, by which to return to the Atlantic. He penetrated beyond the limits of former navigators,



Orange Harbour, Strait of Magellan.

advanced along a mountainous coast to N. lat. 48°, landed and had communication with natives, and named the country New Albion, which is now divided between the states of California, Oregon, and Washington territory. But having just left the tropics, the lowering temperature so affected his men that he desisted from a northerly course. Drake now determined to steer across the Pacific Ocean to the Moluccas, and thus return home by circumnavigating the globe—an achievement which had been only once before accomplished, when Magellan struck across the Pacific homewards in 1520. Drake regained Plymouth on the 26th September, 1580, after an absence of two years and ten months, being rather more than two months less than the time occupied by Magellan's expedition.

As nature refused to block up the Magellanic channel, the court of Spain resolved to close it to all foreign vessels by fortifications at the narrows, and colonies to keep watch and ward, wholly overlooking the rigorous climate and inhospitable shores. A fleet of twenty-three ships, carrying 3500 men, sailed from Cadiz in 1581 with this object in view, and proved one of the most disastrous expeditions on record. Five vessels went down with 800 souls on board

in a storm at the outset, and owing to a series of misfortunes only a remnant of the force reached its destination. Two settlements were founded with high-sounding names, wooden houses, and bastions. But the mother-country seems not to have bestowed a thought upon the colonists after sending them out, and they perished by scores of cold and famine during the first winter. It set in with uncommon severity, snow falling incessantly for fifteen days in April. When Thomas Cavendish, with an expedition somewhat similar to that of Drake, arrived at the strait in 1587 he found many lying dead in their houses and in their clothes, the survivors not having had strength to bury them. Fifteen men and three women were alive, miserable beings, harassed by the natives while wandering along the shore in search of shell-fish and herbs, occasionally stumbling upon the dead body of a comrade to remind them of their own approaching doom. Yet these wretched outcasts hesitated to trust themselves to the English heretics, when offered a passage to Peru, and a favourable wind bore away the vessels in which they might have been saved.

The finding of a new passage into the Pacific Ocean by sailing round the islands of Tierra del Fuego, extinguished

for ever any lingering hope Spain might cherish of being able to guard the entrance to it. This took place in 1616, when Schouten, a practical seaman, and Le Maire, son of an Amsterdam merchant, rounded the islands after encountering much boisterous weather. For joy of the accomplishment an allowance of three cups of wine was dealt out to all the men on board; and Schouten called the terminating headland, which was covered with snow, Cape Horn or Horn, from the name of his native place, a town in West Friesland.

The further extremity of America was first made known by an expedition ordered almost in his last moments by Peter the Great, to sail from Kamchatka towards the north and east, to ascertain whether the Siberian land did not adjoin that of America. The mission was intrusted to Captain Vitus Behring, a Dane by birth, with Alexei Tchirikof as second in command. In 1728 the expedition ascertained the separation of Asia from America by passing up the intervening channel, on which has been justly bestowed the name of Behring's Strait. Behring, however, was not the first to see the American coast. This was reserved for Krupishief, a Cossack, who sailed from Kamchatka in 1731, and being driven far east by a gale found first an island and then a country of great extent, but did not land. The first exploration of the northern extremity of America gives an insight into the perils that still attended this kind of enterprise, 250 years after the continent was first discovered.

It was in 1741 that Behring was commissioned to undertake another voyage, and sailed on the 4th of June in the *St. Peter*, with a companion vessel, the *St. Paul*, under the command of Tchirikof. Being separated by a storm in the midst of a thick fog soon after starting, they proceeded independently, and never met again. Both were successful in their immediate object, and both encountered mournful reverses. Tchirikof made the coast of America, where the shore was steep and rocky, the surf high, and remained at anchor in deep water, while the mate went in the long-boat with ten men to endeavour to effect a landing. They were seen from the ship to row into a bay. A small cape then hid them from view, and neither barge nor men ever reappeared. In search of them the boatswain and six men were despatched. These likewise never returned, nor was any intelligence gathered of the fate of either party. But a large volume of smoke was observed ascending from the shore; and two canoes came off towards the ship, filled with natives, who, as soon as they saw the number of persons on deck, instantly ceased rowing, and remained at a cautious distance. They then stood up, shouting "Agai, agai!" and returned with all speed to the strand. After cruising in the neighbourhood for some days, in the hope of recovering his men, Tchirikof reluctantly took his leave, and regained Kamchatka. Behring likewise came in sight of the continent at a point where the prospect was grand but gloomy. Mountains of great elevation were discovered covered with snow, to the highest of which, some distance inland, Steller, the German naturalist, who accompanied the expedition, gave the name of Mount St. Elias, which it still bears. This is the culminating point of North America, rising to the height of 17,860 feet above the level of the sea. A party landed, and noticed many traces of natives, but none of them were seen. Some islands were afterwards met with, part of the Aleutian chain, and communication was held with the Islanders, who seem to have made friendly advances with foul intentions, but had no opportunity to carry them into execution. Behring, however, was cast on a desolate island, where he and most of his men perished miserably of scurvy and starvation.

A Russian America was the result of this ill-fated voyage. Hearing from the returned crew that the shores

visited abounded with foxes, sables, ermines, and sea-otters, the Siberian merchants formed themselves into small trading companies to fit out vessels, and sail in the same track. The sea-otters, or sea-beavers, as the traders called them, from the resemblance of their fur to that of the common beaver, were eagerly sought after, as their skins always realized a high price from the Chinese. The animals were taken in nets, surprised in caverns, speared while asleep, and hunted in boats till they were worn out.

In 1745 the agents of these private companies reached the Aleutian Islands, and brought the first tribute of furs from thence to Okhotsk in 1750. To this archipelago the attention of the governor of Siberia at Tobolsk was directed, in 1750, as an imperial possession included in his government. Upon the stock of fur-animals supplied by the islands becoming exhausted, the hunters passed to the adjoining continent; and gradually established settlements and factories, upon more than 300 leagues of coast, which stretched to the British territories, and until 1867 constituted the American possessions of the Russian crown.

Behring had determined the separation of the two continents at the Strait now named after him; but there still remained the question whether the two lands were united further east, or whether a voyage could be made round the northern extremity of America, similar to that of Magellan at the southern end. In this sense the northern outline of the continent cannot be said to have been determined until more than a hundred years after Behring's time, when, after many a gallant attempt had failed, Sir Robert McClure first made the long-sought North-West Passage—an achievement the story of which belongs to our article on POLAR REGIONS, NORTH.

Soon after the Spanish conquests in America became known, the French began to participate in the zeal for adventure, and in 1524 an expedition was despatched by Francis I., under Giovanni Verazzano, a Florentine, who surveyed a line of coast of 700 leagues, comprising the United States and part of British America. But in 1508 Aubert, a Frenchman, had already discovered the St. Lawrence River. Jacques Cartier, also a Frenchman, in 1534 nearly circumnavigated Newfoundland, and entered the Gulf of St. Lawrence. In his second voyage, the next year, Cartier sailed up the St. Lawrence to the habitation of Hochelagen, near the site of Montreal, and brought away a native king to France. The coast of California, on the west side of the northern division of the continent, was discovered by Ximenes, a pilot, who had murdered Mendoza, a captain, despatched by Cortez on a voyage of discovery; the Gulf of California, or Sea of Cortez, was first entered by Francisco de Ulloa, another captain sent out by Cortez in 1593. The Spaniards subsequently undertook several unsuccessful voyages; but they did not abandon their hopes, and at the close of the sixteenth century Sebastian Viscaïno advanced along the western coast as far as the Oregon or Columbia River.

Colonization in North America by England commenced in the time of Queen Elizabeth. Sir Humphry Gilbert was the first to attempt it, though he merely took formal possession of Newfoundland, in 1583; his half-brother, the celebrated Sir Walter Raleigh, in 1584 conducted an expedition which discovered the country he named Virginia—in allusion to his virgin queen Elizabeth. It was not, however, till 1607 that there was planted here, on the banks of the James River, the first little germ of Anglo-Saxon America, in the persons of a band of English gentlemen and a few artisans, who bought land and provisions from the friendly natives. It is not a little remarkable that no less than 110 years should have elapsed after North America was first visited by Cabot, before a single Englishman had effectually settled in the country. A year later the French were following up

the discoveries of Jacques Cartier on the St. Lawrence; Champlain discovered the great Lake Ontario and founded the city of Quebec, which for more than a century was the centre of French trade and civilization in North America, and the point whence the efforts of the Roman Catholic missionaries radiated.

About this same time (1607) the navigator Hendrik Hudson was making attempts to penetrate the north-east passage by Novaya Zemlya, and despairing of success he struck across to the other side of the Atlantic, and in 1609 discovered the beautiful river which bears his name, and at the entrance of which the city of New York now stands. Next year he again bore up north-west, and entered by Hudson Strait into the vast bay beyond, which he took to be an inlet of the Pacific. He intended to winter here, and follow up his discoveries in the spring; but his crew mutinied, and placed him with his gun in a small boat at the mercy of the waves, after which nothing was heard of him.

The violent efforts made by King James to extirpate Puritanism in England drove a large number of the Independents to embark at Plymouth in 1620 for the New World. These emigrants, known as the Pilgrim Fathers, disembarked on the *Mayflower* on the North American coast, in lat. 42° N., on a bay about 200 miles north-east of the river-mouth discovered by Hudson, and there founded the settlement of New Plymouth, calling the land New England. A year afterwards the Dutch bought Manhattan Island (at the mouth of the Hudson River, on which the central portion of the city of New York is built) from the native Indians for twenty-four dollars, and founded there the settlement of New Amsterdam, naming the country round it New Holland. The present name of "New York" was not applied to the country and to the city until some time after the Dutch colonies on the Hudson River had, in 1682, capitulated to the English.

There were now (1621) five European settlements on the North American coast: the Spaniards in Florida (1512), the English cavaliers in Virginia (1607), the Dutch at the mouth of the Hudson (1621), the English Puritans more to the north (1620), and the French on the St. Lawrence (1608); in 1638 a sixth was added by the Swedes, who then colonized the Delaware River. In 1635 British settlements were formed on the South American mainland in Guiana at the mouths of the Berbice and Surinam, and by the French in Cayenne further east. In 1670 the Hudson's Bay Company was formed, consisting at first of Prince Rupert, cousin of Charles II. of England, and certain associates of his, who were invested with the absolute proprietorship and sovereignty of all the territory draining into Hudson's Bay and its strait. In the same generous mood the Merry Monarch made a grant of the whole country from the Atlantic to the Pacific Ocean, between the parallels of 29° and 36° 30', to eight needy courtiers—the allotment embracing twelve of the present United States and a large portion of Mexico! The charter constituted them absolute proprietors of the soil, with power to establish cities and manors, baronies and counties, create orders of nobility, erect fortifications, and levy troops. The first settlers sailed in 1670, and founded Charleston, while the two Carolinas further commemorate the name of a munificent donor who could in a free and easy manner give away estates numbering millions of square miles. In 1682 Charles also granted very extensive territory to William Penn, who purchased portions for colonization from the Delaware Indians, and founded the state which bears his name (Pennsylvania), combined with *ayra*, "wood." The last settlement formed on the American mainland during the seventeenth century was by the French, who, after their countryman La Salle had first descended the Mississippi (1682), invaded Spanish claims by settling in Louisiana, about the mouth of the great river, in 1699.

In 1733 the English extended their colonization southwards from Carolina, naming the new country, after the English king, Georgia. In 1756 there broke out the Seven Years' War, in which Britain took the part of Prussia against France, Austria, and Russia, and during this contest Wolfe made his conquest of the French Canadian possessions. From the tropical swamps of Florida far away to the uninhabitable frozen north was now one vast British settlement, rapidly growing in population and material wealth; so much so, in fact, that it occurred to statesmen at home that the finances of the United Kingdom might fairly be relieved by the colonies being taxed to pay for their own necessary defence. The colonists, however, objected to be taxed by Imperial authority, even though the money was to be spent solely for their own direct benefit; and the experiment ended in leaving the English masters of Canada only, while the United States entered upon an independent career, which will be treated of in its appropriate place.

Early British researches in North America were chiefly directed to the examination of the western coast, under Cook, Clerke, Meares, Vancouver, &c.; to the development of our great Canadian dominion; and to arctic or north-west expeditions. During the reign of Henry VIII. attempts were made by the English to find the north-west passage to India without success; and in the next reign Sir Henry Willoughby failed in his search of a north-east passage. Three successive voyages in search of the north-west passage were made in the reign of Elizabeth by Martin Frobisher, who in 1576 and the two following years explored Labrador and Greenland, but without any further result. Among our early north-west voyages of discovery may be mentioned those of Davis, in 1585; of Weymouth, in 1602; of Keelson, in 1606; of Hudson, in 1610; of Button, in 1612; and of Byles and Baffin, in 1615, from the latter of whom Baffin's Bay has been named. Nothing more was done till 1772, when Richard Hearne travelled from Hudson's Bay to the Frozen Ocean, and discovered the Coppermine River. In 1793 Alexander Mackenzie traced the Mackenzie River to its mouth in the Frozen Ocean, and also crossed the Rocky Mountains to the Pacific. In 1818 the British government commenced that series of expeditions which, aided by the Hudson's Bay Company and by private enterprise, and conducted by Parry, John and James Ross, Lyon, Franklin, Richardson, Beechy, Simpson, Rae, McClintock, and others, have resulted in those interesting discoveries detailed under POLAR REGIONS, NORTH.

Sir John Richardson, in his "Journal of a Boat Voyage through Rupert's Land and the Arctic Sea" (London, 1851), gave a general account of the physical geography of British and (at that time) Russian North America, which contained much valuable information, and enabled us to lay down for the first time some of the leading geographical features in north-western America, namely, the country between the Mackenzie River and Behring's Strait. In 1853-56 Sir William Logan was employed on a geological survey extending from the coast of Labrador on the east, separating Lower Canada from Rupert's Land, and extending to Lake Superior, in which he discovered the oldest system of rocks yet known, and named by him the Laurentian.

In consequence of the growing importance of British Columbia and Vancouver Island, it became desirable, if possible, to discover some practicable passes over the Rocky Mountains to connect them with Canada. In 1857-60 Captain Palliser, Dr. Hector, M. Bourgeau, and Lieutenant Blakiston were engaged in making a survey for this purpose, and they discovered several passes all leading from the South Saskatchewan River, and between 49° and 52° N. lat. In fact, it was found that the mountains, which are from 50 to 60 miles broad, might be crossed with less difficulty than was supposed.

Among the most interesting recent explorations in British North America was one made by Viscount Milton and Dr. Cheadle in 1862-63. They proceeded from Quebec to Chicago, thence through Wisconsin and Minnesota, and down the Red River to Fort Garry (now Winnipeg), in Rupert's Land (now the North-west Territory). They left Fort Garry on August 23, and reached Fort Carlton, a settlement of the Hudson's Bay Company on the north branch of the Saskatchewan River, on the 26th of September. On October 10 they left this fort, and travelled north-westward, but in about a week went into winter quarters till 3d April, 1863, when they started westward through a fine country, and reached Edmonton, another station of the company on the North Saskatchewan. On June 3 they left for the Athabasca River and the Rocky Mountains. Their journey to the mountains was through a country well watered, with fertile plains, dense forests, and occasional swamps, coal-fields lying beneath a great part of their route. Having crossed the Athabasca they entered a narrow rocky ravine, the valley of the Myette, beset with rocks and boulders. On the other side of the river Myette the track improved, and on July 10 they struck the Frazer River, but they could not keep very near it in consequence of the spread of water and the steep and rugged mountains. After experiencing great difficulty and danger they reached Moose Lake, a fine sheet of water into which the river expands, and ultimately arrived at the settled districts of British Columbia.

The same journey of nearly 3000 miles across the Canadian Dominion, by somewhat different routes, was accomplished in 1872 by Mr. Sandford Fleming, and in 1873 by Captain Butler. The latter, in his "Wild North Land" (London, 1874), described in glowing terms the unequalled beauty and grandeur of the scenery of the Peace River Pass. The noble river flows on its journey of 2000 miles to the sea in a broad powerful stream of 250 to 300 yards in width, at times cleaving its way through mighty chasms in the mountains, "whose steep cliffs frown down on the black water through 6000 feet of dizzy vertice."

Since 1867 the various portions of British North America (excepting Newfoundland) have been fused into one grand Dominion, the rights of the Hudson's Bay Company have been transferred to the Dominion government, and Canada has entered upon a magnificent career of development and progress. Probably no newly-settled country in the world ever made such rapid and substantial strides in material prosperity as Manitoba—a province situated in the heart of the Dominion, sliced off the great North-west Territory. Up to that time it was known as the Red River Settlement, and "Fort Garry," a trading station of the Hudson's Bay Company, was the principal town. Fort Garry, under the altered name of Winnipeg, became the capital of the new province of Manitoba, and from a collection of huts inhabited by 253 people in 1870, it had by 1882 become a cathedral city with 20,000 inhabitants, living in wide handsome streets, and owning substantial public buildings such as would do no discredit to any city in Canada or the United States.

The United States government, on becoming possessed of Louisiana in 1803, sent Captains Lewis and Clarke to explore the regions west of the Mississippi. They traced the whole course of the Missouri to its source, and made a map of the adjacent regions. Mr. Dunbar and Dr. Hender explored the Red River in 1804. General Pike, in 1805-1807, made many researches west of the Mississippi. In 1819 Major Long explored a wide range of country included between the Mississippi, the Missouri, and the Arkansas; and in 1823 the same officer, accompanied by Lewis, examined a part of the region westward of the great Canadian Lakes.

Several other expeditions were subsequently made, under the auspices of the United States government, to various parts of their territories, the most important being that of Captain Fremont in 1842-44. His geographical researches embraced the immense tract of country extending from the confluence of the Kansas River with the Missouri, to the cataract of the Columbia and the missions of Santa Barbara and Pueblo de los Angeles in New California. The other expeditions, surveys, and journeys were undertaken by Albert, Wislizenus, Cooke, Johnstone, Emory, Stansbury, and Richardson. These surveys not only disclosed millions of square miles of magnificently fertile land suitable for every requirement of man, but made known wonders and beauties of nature exceeding anything of the kind in the Old World. Some of these were first described by Richardson in "Wonders of the Yellowstone Region in the Rocky Mountains" (London, 1874). The Yellowstone is an upper tributary of the Missouri, and the basin in which its head waters take their rise lies 6000 feet above the sea, buried in the recesses of the Rocky Mountains, hidden from view, and shut in on every side by huge mountain barriers of 8,000 to 10,000 feet in height. Some of these are absolutely impassable, and others are penetrated only by obscure and difficult passes. An expedition under official auspices, profiting by the experience of previous attempts, sought a passage through the encircling mountains on the northern side, up the valley of the Yellowstone itself, succeeded in forcing an entrance into the central basin, and found their toil and enterprise amply rewarded by the plenty of a land abounding with fish and game, by scenery of extraordinary beauty and grandeur, and by the discovery of wonderful natural phenomena.

The Yellowstone was found bursting through the mountain chains which encircle its sources by a succession of profound chasms of from 800 to 3000 feet in depth. The basin of the river is nearly circular in form, from 50 to 75 miles in diameter, about 2000 feet below the great ranges which form its outer rim, and would appear to have been in past ages the scene of wonderful volcanic activity. The only remains of this action now are thousands of hot springs, two of which, the Grand Geyser and the Giant Geyser, are of unparalleled altitude and splendour. The former ascends in one great body of water, 20 by 25 feet, to the height of 90 feet; and from the apex of this column five great jets shoot up, radiating slightly from each other to the immense height of 250 feet—the earth trembling under the descending deluge from this vast fountain, the grandest and most majestic in the world. Great clouds of steam rise upwards of 500 feet, while the waters pour in a seething flood down the slope into the river. Entombed within the surrounding forests of the basin, at a height of 7788 feet above the sea, lies a large and lovely lake, which forms the crowning beauty of the scene and the grand reward of the traveller's toil.

The district is comprised within the western territory of Wyoming, some considerable distance from the most populous portions of the States. On the ground, however, of its containing so many marvels of nature, the United States government reserved the whole district from sale or settlement, and set it apart as a great national park. Most things in America are on a bigger scale than anywhere else, and no other country in the world has a "park" like this, measuring 3578 square miles.

Further south the basin of the Colorado presents features which are in some respects the most extraordinary on the earth's surface. The entire basin consists of a series of table lands, rising one above the other, and all cut through to a vast depth by the main stream and its tributaries, which rise in most cases amid the snows of the highest ranges, and run in rapid and perennial sources to the

plains at the head of the Californian Gulf. The plateaus rise by successive gradations from 4000 to 7000 and 8000 feet; they are broken through along the lines of water-courses, and generally present towards those lines abrupt wall-like escarpments. Complete barrenness prevails on all these broad lands; little vegetation except *Artemisia* scrub is to be found from the 36th to the 42nd parallels along the plateaus, and wide tracts exhibit nothing but bare rock on the surface. The beds of nearly all the rivers are sunk to a depth of hundreds and thousands of feet below the level of the country, and they thus flow through narrow sharply-cut gorges or canons—a phenomenon not unknown in other regions, but here displayed on the grandest scale conceivable. The main stream of the Colorado flows for 500 miles at the bottom of a chasm from 3000 to 5000 feet deep. The walls exhibit a succession of geological strata corresponding on the two sides, and this fact, coupled with other circumstances, leads to the conclusion that this wonderful phenomenon is due simply to the slow action of running water; in short, that the river and its tributaries have, in the lapse of ages, cut down their beds through all the sedimentary strata and several hundred feet into the granite base on which they rest. Amongst the first to describe this remarkable country was Dr. Bell, in his "New Tracts in North America" (London, 1869).

The countries which were solitary wilds in the days of Fremont are now covered with busy, thriving, and rapidly-increasing populations. Not only has the number of the people increased at an unprecedented rate, but the area of the states has been enlarged—on the south by the incorporation of portions of Mexico, and in the far north by the purchase of what was long known as Russian America. The discovery of gold in California, the immense popularity of the States as a field for emigrants from Europe, the very favourable terms of settlement and acquisition of land offered by the great Republic, and the extraordinary facilities presented by nearly 100,000 miles of railway for easily reaching any part of the vast area between the Atlantic and Pacific, have all combined to render every part of the 3,500,000 square miles comprised by the United States as familiar as any English county.

Exploration and settlement has not proceeded at anything like the same rate in the southern part of the continent. De la Condamine, Godin, and other men of science, were sent out by the French and Spanish governments in 1735 to measure an arc of the meridian in South America. The results of this expedition, published by Ulloa in Spanish, and by Condamine in French, added largely to the existing knowledge of South America. But of far higher value were the researches of Humboldt and Bonpland between 1799 and 1804. During this period they traversed the country from Mexico to Lima, and accumulated vast stores of information. Bonpland started from Buenos Ayres on another expedition into the interior in 1818. About the same time Dr. Spix and Dr. Martius commenced a laborious series of researches in Brazil; and the South American states, on establishing their independence, sent out various expeditions of a minor kind. Between 1828 and 1835 three European travellers, descending the Amazon, traversed the whole breadth of South America from the Pacific to the Atlantic—viz. Lieutenant Mawe, R.N., in 1828; Dr. Pöppig in 1831; and Lieutenant Smith, R.N., in 1834. The researches of Pöppig were especially valuable, for he returned with dried specimens of 17,000 plants—many before unknown—several hundred stuffed birds and animals, and a large number of sketches. About the same time another extensive journey was accomplished by Alcide d'Orbigny, who travelled through the Banda Oriental, Patagonia, La Plata, Chili, Peru, and Bolivia. More important still were the results of the

great surveying expedition of the *Adventure* and *Beagle*, which not only made a very careful survey of the coast on both sides of the continent south of the equator, but also made several excursions into the interior, and brought home a greater mass of geographical information than any previous expedition. Very valuable collections in all departments of natural history were made by Mr. Charles Darwin, the naturalist of the expedition, and whose work, "A Voyage Round the World," can still be read with interest. During the years 1835 to 1844 Sir Robert Schomburgk explored British Guiana and the country to the west as far as the Orinoco and Cassiquari. On reaching the Upper Orinoco he was enabled to connect his observations with those of Humboldt, and thus was completed a series of fixed points, astronomically determined, along a line extending from the Atlantic to the Pacific.

The river Amazon has been visited by Mr. Wallace, Mr. Bates, and M. Agassiz, all of whom have contributed much useful information respecting it and the country around it. The river is now navigated to more than 3000 miles from its mouth. The Rio Purús, one of its affluents, was explored by Mr. Chambliss in an open boat in 1864—the first European who had ever ascended it. He found the Indians on its banks in such an exceedingly primitive state that they still used stone hatchets, and the animals on the banks of the river showed no fear at the appearance of strangers.

Several attempts have been made by the Peruvian government to explore the rivers in their eastern territory, and endeavour, if possible, to open up water communication with the Atlantic, which would prove of innumerable importance to the country. In 1869 the explorers ascended the river Ucayale from its confluence with the Marañon to the place where it is formed by the junction of the Urubamba and Tambo, a distance of 772 miles. The country passed through on this long voyage was before unknown. It is described as salubrious and fruitful, with facilities for trade.

In 1868 Captain Burton explored the highlands of Brazil, and descended the river San Francisco on a raft, a distance of 1500 miles from Sabara to the sea. He found that the highlands, instead of being, as was generally supposed, a swampy flat, are exceptionally healthy, and the scenery in many parts exceedingly grand.

Withal, however, South America, though possessed of magnificent and boundless resources, has been left far in the background by the rapid strides of development made by the northern portion; and the reason will be better understood if the circumstances of the history of South America are remembered. From the period of their discovery until the early part of the present century, Mexico and nearly the whole of Central and South America, were held as colonies by Spain and Portugal. The cruelty and unscrupulousness with which the continent was in the first instance conquered, was even exceeded by the ferocity with which the Indian subject populations were subsequently treated. Documents long buried amidst the Spanish archives depict acts of extortion, perfidy, cruelty, and oppression practised upon the Indians such as have rarely been paralleled—priests vying with laymen in extracting money from those they ought to have protected. As the sole aim of the Spaniards in the colonies was to enrich themselves, so the government at home made all its acts and regulations subordinate to the grand object of raising a revenue. Spain retained in her hands the whole trade of the colonies, and guarded her monopoly with the most severe penalties. The price of all European commodities was enhanced three, four, or six fold in America. The colonists were not allowed to manufacture or raise any article which the mother country could supply. They were compelled to root up their vines and olives, and for a long time one

colony was not even permitted to send a ship to another. To support such a system it was necessary to keep the people in profound ignorance, and to encourage prejudice and superstition. Schools were extremely few; permission to establish them was often refused, even in towns where the Spaniards and Creoles were very numerous; while the importation of books, except books of Catholic devotion, was rigorously prohibited. Even the more grave and dry sciences, such as botany, chemistry, and geometry, were objects of suspicion. And the more effectually to crush all mental activity, natives of America could rarely obtain leave to go abroad, to seek in foreign countries what was denied them in their own. The priests, sharing in the spoil, filled the minds of the people with childish superstitions as a means of confirming their own power, and employed the terrors of religion to teach them patience under oppression. To create a race of servants devoted to its purposes the court bestowed all offices, from the highest to the lowest, on natives of the peninsula exclusively; and a swarm of public functionaries had unlimited power of interfering, vexing, harassing, and plundering under the forms of law. In Brazil the Portuguese carried out a policy similar to that pursued in the Spanish colonies. The monopoly which the mother country retained of the commerce of the colony was equally rigorous, the restrictions on its internal industry as severe, and the same means were employed to keep the people in a state of pupillage and ignorance. Down to 1806 the printing press was unknown in Brazil. It seems strange, but it is no less true, that for three centuries Spain and Portugal were able to carry out a system utterly unjust and immoral, and in which the interests of many millions of human beings were habitually and unrelentingly sacrificed. A cruel wrong was undoubtedly done to the colonies themselves, for throughout all those long generations the people were so cradled in superstition and prejudice as to effectually retard their social and material progress under conditions of freedom. Nor were either of the two countries ever profited by the system, for in the days when heavily-laden galleons were incessantly arriving with the rich treasures of her American colonies, Spain was, as regards finances, almost in the same beggared condition as in more recent times.

It is hard to say how long Spain and Portugal would have retained their American colonies but for the advent of Napoleon Bonaparte. In 1808, when Ferdinand was deposed and Joseph Bonaparte elevated to the throne of Spain, the relations of the colonies with the mother country were unsettled. Ferdinand, being a prisoner, was, politically speaking, a nonentity, while Napoleon's brother, clearly an usurper, was odious to and rejected by the mass of the colonists. In this crisis they would probably have declared for independence at once, but that the land was overrun, and all public situations occupied, by a host of Spaniards who were averse to a change which they foresaw must lead to the downfall of their power. This was perfectly understood by the other classes, and in the first movements which took place nothing was said derogatory to the supremacy of Spain, though independence was clearly aimed at. By spontaneous efforts *puntas* of government were formed—first at Caracas in 1809, and then at Pinar, Buenos Ayres, and Chili. In 1810 the first insurrection broke out in Mexico, but unfortunately the colonists had been too long the slaves of superstition and tyranny to carry out their bold stroke successfully at first. After a hot though bloody struggle the *puntas* were nearly all put down—only, however, for a time; for freedom once in view was not to be lightly surrendered. The story of the struggle, varying, variable, and protracted struggles which so long continued, and resulted in entirely freeing America from the Spanish yoke, will be found in our articles upon

the various countries concerned. With the surrender of Callao in 1826 the Spanish flag ceased to wave over any part of the continent, and of all her vast possessions in the New World only the islands of Cuba and Porto Rico now own allegiance to Spain. Brazil, as is shown in the article devoted to that country, rose from being colonial to be imperial and independent without any violent revolution, and the result has been greatly in favour of the peace and prosperity of the country.

One of the causes which has been most effectual in retarding the progress of the various South American countries has been the almost ceaseless state of internal strife, revolution, and war that has prevailed—all probably arising, however, from the depth of miserable ignorance, superstition, and lazy habits into which the people had sunk under centuries of misgovernment and oppression. No sooner has it been discovered that one country enjoyed any special advantage arising from its natural circumstances than the whole benefit that might have been conferred by it has been dissipated by having to defend it in bloody and exhausting wars, against the avaricious jealousy of a neighbour. In this way vast mineral treasures and guano deposits, which might have been to the countries concerned—as the Californian gold-fields were to the United States—sources of untold wealth and splendid impulses to civilized settlement, have had all their advantages frittered away by wars which have decimated the people, impoverished the countries, and made them utterly disreputable. Fortunately, however, it is beyond the power of depraved human passions to exhaust the bounties of nature, and the latter will remain while the former will probably in course of time, if only from the mere instinct of self-interest, be placed more under control.

Looking at the marked contrast in the development of the United States and Canada, as compared with the portions of America settled by Spanish and Portuguese, it is curious to speculate what might have been the course of events had not Columbus changed the course he intended to pursue when on his first great voyage of discovery. Guided by a sea-chart furnished him by Toscanelli, the Florentine astronomer, Columbus intended to have held on his way along a parallel of latitude from Lisbon. Uneasy, however, at not falling in with Zipangu (Japan), as he expected, he was persuaded by Martin Alonso Pinzon to steer to the south-west, and after a long debate yielded. The result singularly exemplifies the influence of small and apparently trivial events on the world's history. If Columbus, resisting the counsel of Pinzon, had kept his original route he would have entered the warm current of the Gulf Stream, and probably been carried to Cape Hatteras and Virginia. The result would probably have been to give the present United States a Roman Catholic Spanish population instead of a Protestant English one—a circumstance of immeasurable importance. Pinzon was guided in forming his opinion by a flight of parrots towards the south-west. Never had the flight of birds such momentous consequences, for in this case it may be said to have determined the first settlements on the new continent, and its distribution between the Latin and Germanic races.

AMERICANISM, a term used to express some peculiarity in the language of the inhabitants of the United States of North America. The following are some of the more common:—

Ambition, used as a verb instead of *aspire*. *Approbate*, used instead of *approve*. *Baggage*, used to signify the trunks, boxes, valises, clothing, &c., of a traveller. The English say *luggage*, and consider baggage pretensions. *Balance*, meaning remainder; for example—“Two of the professors were dismissed, but the balance were retained.” *Bogus*, meaning counterfeit, false, fraudulent. *Boss*, meaning an employer or superintendent of

labourers. *Brash*, for brittle. *Buncombe*, or more generally *bunkum*, is used in reference to speeches or expressions intended only to catch the applause or favour of the vulgar. *Cable* is used as a verb, and is employed with reference to the messages sent by the Atlantic telegraph cables. *Cablegram* is used to denote the message itself. *Conclude* is used by Americans in the sense of determine; as, "I have concluded to go." *Conclude*, in Great Britain, is used to signify the formation of an opinion, but not of an intention. *Corn* means only maize in the United States; in England it means grain generally. *Dead-head*, a person who gets something of commercial value without special payment or charge. *Declination*, the refusal to accept a nomination to office. *Elect*, in the sense of choose; as, "he elected to go to Europe." *Eventuate*, meaning to result in. *Expect*, misused in application to past events; as, "I expect it was." *Fix*, in England, means to fasten or make firm; in America it means almost anything in the way of putting in order, adjusting, mending, setting to rights, or making. *Gerrymander*, a method of arranging election districts so that the political party making the arrangement will be enabled to elect a greater number of representatives than they could on a fair system, and more than they should have in proportion to their numerical strength. *Go ahead* is of American origin, and is used by Americans in cases where the British would say "all right." *Guess* is an exceedingly common expression in America, being employed in the sense of imagining or supposing. The expression *I guess*, however, though having the look of a genuine Americanism, is but one out of numerous real old English expressions and words, preserved in the United States, but obsolete in the old country. Chaucer, Spencer in his "Faerie Queen," and Locke each make use of it. *Interview* is used as a verb, and is especially employed with regard to the visits of reporters to distinguished individuals. *Loafster*, Americanism for lounging. *To lobby through*, is to get a bill adopted by underhand influence. *Necessitate* is an Americanism much objected to by English writers. *Posted-up* is an Americanism for well informed, thoroughly conversant with. *Quite*, in the sense of "very," is in universal use by Americans, in such phrases as "it is quite cold." *Rooster* is an Americanism for "cock," a male barn-door fowl. *Stall* is used in the United States to signify stick fast; as, "the waggon is stalled." *Skedaddle*, to run away. *Suspenders* is the genteel, as *gallowses* is the vulgar, American name for the articles known in England as braces. *Waggon*, or *wagon*, according to the usual American spelling, is often used in the United States as a verb.

In 1873 M. Schele de Vere, LL.D., published a very useful book, entitled "Americanisms, the English of the New World." See also Barley's "Dictionary of Americanisms." In America, however, new words are a matter of every-day formation; and when the American has seized upon or invented an expressive word, he works it into half a dozen forms, and secures it a currency in two or three parts of speech. There are, in fact, processes at work in modifying speech not unlike some of those which helped to change Anglo-Saxon into English.

AMERICAN-ORGAN, a keyed instrument of the free-reed or harmonium kind, the wind being drawn through the metal vibrators by exhaust-bellows, instead of being blown through by force-bellows as in the harmonium. The vibrator is bent both in the direction of its length and of its breadth, so that in striking the air as it vibrates in its box it does not do so with a slap, as with the old-fashioned harmoniums, but in a graceful curving sweep, one corner leading the plunge. The result is a very sweet, smooth, pipe-like tone, quite free from the old objectionable burr and harshness. Many different stops

are produced, of varying qualities. A simple arrangement, resembling the Venetian swell of the organ, gives a very sensitive and perfect expression; and a delicious waving tone, resembling the "close shake" on a violin, is produced on any of the stops desired, by a fan revolving just where the air is drawn into the reeds. Organ pedals are often fitted to it, so that it becomes an efficient substitute for the organ. The instrument still retains its name as above, though of French origin, and though since its introduction into England English makers have succeeded in surpassing their American predecessors. The American name for the instrument is now Parloir-organ or Reed-organ, and used to be Melodeon.

AMERSFOORT, an ancient town of Holland, in the province of Utrecht, 24 miles E.S.E. of Amsterdam, on the river Eem, which flows into the Zuyder Zee. It possesses a court of justice, a Jansenist college, and several schools. The Church of St. Joris dates back to 1248. Amersfoort was captured by Archduke Maximilian in 1183, and twice by the French—in 1672 and 1795. The chief manufactures are cotton, woollens, and glass; and considerable trade is carried on in tobacco (which is grown in the neighbourhood), corn, and dried herrings. Population, 14,000.

AMERSHAM or **AGMONDESHAM** is a market town of Buckinghamshire, situated in a valley not far from the river Colne, 28 miles W.N.W. of London, 12½ from Aylesbury, and 8 from the Berkhamstead station of the North-western Railway. It has some manufactures of black lace, straw-plait, and chairs, and a large brewery. The parish church, near the centre of the town, contains some fine monuments. There are dissenting chapels, grammar and free school, literary institute and reading room, and union workhouse. The town-hall, erected by Sir William Drake, dates from 1642. Amersham was formerly a parliamentary borough, but was disfranchised by the Reform Act in 1832. The poet Waller, who twice sat for the borough in Parliament, was born at Colehill, in the parish of Amersham, in 1605. The population of the parish in 1881 was 2500.

AMESBURY, a town in Wiltshire, formerly called Ambroselbury or Ambresbury, 7 miles north of Salisbury, 82 from London, and 4 from the Porten station of the London and South-western Railway. It is situated on the east bank of the Avon, lying in a deep and narrow valley, and is of great antiquity. It contains an ancient church, which probably once belonged to an abbey, and has a neat cemetery. There is also a splendid edifice erected by Laigo Jones for the Duke of Queensberry. The market formerly established here has been discontinued, and there is but little trade. In the neighbourhood are the remains of a Celtic encampment, erroneously called Vespasian's Camp, and Stonehenge is in its vicinity. At the parsonage house of Bilston, near Amesbury, Joseph Addison was born in 1672. Population of the parish, 1127.

AMETHYST is a precious stone of a clear violet colour. It was known to the ancient Greeks, and supposed by them to be a "remedy against drunkenness," a belief expressed by the name *επιφύρεσις*. The common amethyst is a crystal of quartz, other varieties being rock crystal, cairngorm, and aventurine. Colourless quartz is composed of pure silica (SiO₂), and the amethystine colour upon which the value of the stone mainly depends is really due to the presence of an impurity, either manganese or a compound of iron and soda. The most valuable amethysts come from Asia, but they are also found in Europe; and some years ago a vein of amethyst was opened in Kerry Head, Ireland. The usual form in which it occurs is a six-sided prism, with six-sided pyramids at both ends. The specific gravity is 2.5-2.8. Quartz cannot be scratched with a knife, and in Mohs' scale of hard-

ness it is put at 7, fluor spar being 4, and the diamond 10. Many ancient gems are amethysts.

The **oriental amethyst** is a violet-coloured crystal of corundum, which also occurs as the ruby, sapphire, emery. Corundum, in composition pure alumina (Al_2O_3), crystallizes in a different system (*rhombic*) from quartz (*hexagonal*); here the type is the rhombic pyramid, consisting of two four-sided pyramids with their rectangular bases coinciding, and the three axes of different lengths. It is much harder than quartz, being 9 in Mohs' scale, and its specific gravity is greater—about 4.

AMHARIC LANGUAGE has its name from Amhara, in Abyssinia, where it is spoken in its greatest purity. The Amharic is supposed to be meant by Agatharchides when he speaks of a language called Kamara. The Amharic began to prevail in Abyssinia over the Geez language, when Leon-Amlak, about the year 1300, having overcome the Zagaeu dynasty, ascended the throne of his ancestors, and removed the residence of the royal court from Axum to Shoa, where he had lived in exile. A knowledge of the Amharic enables a traveller to make himself understood in nearly every part of Abyssinia, although there are numerous dialects of which no complete classification has yet been accomplished. The King of Abyssinia, his councillors, ecclesiastics, monks, and every well-educated Abyssinian, know the Geez language, in which documents and letters are usually composed. Therefore the Geez is called *lesumu metchaf* or *metchafña*—that is, the language of letters or books.

The Amharic adds to the twenty-six characters of the Geez seven others, which are mere modifications in order to express some characteristic sounds. The vowels are expressed by variations in the shape of the letters, so that each character or letter is in fact a syllable, being a consonant followed by a vowel; thus, *la, le, li, lá, lí, ló, lo*. The Amharic, with other Ethiopic dialects, is written from the left to the right hand, like our western languages. See **ETHIOPIAN LANGUAGES**.

AMHERST, a district and city in the Teasserim division of British Burmah. The District lies between 14° and 17° N. lat., and between 97° and 98° E. lon., and consists of a narrow strip of land on the shores of the Indian Ocean, being separated on the E. from the kingdom of Siam, by the Dawna Mountains. It is watered by several rivers, which flow through rich alluvial plains; the chief are the Salween, Gyang, Attaran, and Thoungyeng. Rice forms the staple article of trade, and is brought down by water in large quantities to Maulmain, the chief town, and administrative headquarters. The other towns are Amherst and Martaban. There are extensive forests of teak. Lead ore has been found, and hot springs exist. The rainfall is very heavy, but the temperature is a tolerably even one, and not excessive. Before 1826, when the country east of the Salween was ceded to the British after the first Anglo-Burmese war, Amherst was the scene of perpetual warfare between the kings of Siam and Pegu. It was then almost uninhabited, but numerous immigrants from Burmese territory settled here, and in 1881 the population numbered 250,000, the majority of whom are a people called Taluings. The southern portion of the district was annexed after the second Burmese war, by Lord Dalhousie, in 1853.

AMHERST, a seaport town in the above district, situated on the south bank of the estuary of the Salween River, which here falls into the Gulf of Martaban. This town was built by the British in 1826, on the termination of the Burmese war, in order to supply the place, as a military post of Martaban, which was restored to the Burmese under the provisions of the treaty. The place was named in honour of the then governor-general of India. It was made the capital; but in the following year

the headquarters were transferred to Maulmain, which has since absorbed the trade of the whole province and district. Amherst is a bar harbour, with rather a dangerous entrance; but when this is passed the anchorage is good, and there are 5 fathoms water within 100 yards of the shore. It is now only important as a pilot station, with a telegraph office.

AMHERST, a township of Massachusetts, United States, in county Hampshire, 82 miles W. of Boston, on the Connecticut river. It has some manufactories of machinery, cotton goods, &c., but is chiefly known as the seat of Amherst College, a flourishing institution founded in 1821, with an observatory, museum, and a good library of over 20,000 volumes. The Massachusetts Agricultural School, established in 1863, occupies some fine buildings here, and is one of the best in America. The population in 1881 was 5000.

AMHERST, WILLIAM PITT, Earl Amherst, was born on the 11th of January, 1773, and succeeded his uncle Jeffrey, first Lord Amherst, in August, 1797. Lord Amherst was one of the Canada commissioners, and after being employed on a visit to Northern Italy he undertook in 1816 an embassy to China, in order to place our commercial relations with that country upon a better footing. Lord Amherst sailed from England in February, 1816, and landed at Ta-ku, at the mouth of the Pei-ho, on the 12th of August. An attempt was made by the Chinese to enforce the practice of the kotau—that is, striking the head on the ground, as a sign of homage, before a yellow screen—as a preliminary to a repetition of the same ceremony before the emperor. This was refused by Lord Amherst, upon the advice of Sir George Staunton, who had been present on a similar occasion with Lord Macartney in 1793, when the same thing was proposed and refused. Lord Amherst and his suite arrived at Peking on the 28th of August, at dead of night; but the gates were closed against them, and it was dawn before they entered the city, which they left the same afternoon, without having accomplished the object of this expensive expedition. Upon hearing of the failure of the English mission the governor of Canton issued a proclamation, declaring that the ambassador would not be allowed to embark in the river, but must, after traversing the country, find his way as best he could to the ships, which were to remain at anchor among the Ladrone Islands, almost in the open sea. By the firmness, however, of Captain Maxwell, the embassy entered the river, and were in the end very civilly treated by the Chinese. He reached England in October, 1817, after an absence of twenty months. He also visited the Emperor Napoleon at St. Helena. Lord Amherst was subsequently appointed governor-general of India, and raised to the rank of an earl in 1826, in consequence of his services there. The last thirty years of his life were spent in retirement. He died 13th March, 1857.

AMHERSTBURGH, a town of Canada, in the western district of the province of Ontario, in the township of Malden, Essex county. It stands on the northern shore of Lake Erie, near the mouth of the river Detroit, and on its eastern side. It was one of the earliest settlements of Upper Canada, and is named after Lord Amherst. Being a frontier town, it has some military defences. There is a very safe and commodious harbour, with a good anchorage, in 8½ fathoms water. The surrounding country is highly fertile, and the climate good. Apples, pears, peaches, plums, nectarines, and grapes are produced in great perfection and abundance. The lake and river furnish a plentiful supply of excellent fish, and the woods contain abundance of game. There is a large trade in timber. The population in 1881 was 2500.

AMIENS, an ancient town of France, capital of the department of Somme, and formerly of the province of

Picardy, 71 miles N. of Paris. It is of Celtic origin, and existed at the time of Cæsar's invasion of Gaul, under the name of *Samarobriua*, which denotes a bridge over the *Samara*, now the *Somme*. At a later period it acquired the name of the tribe of which it was the chief town, the *Ambians*; this name, under a modified form, it still retains.

Amiens is the seat of a high court, of a tribunal of commerce, and of a bishop. The modern town is well built, with broad straight thoroughfares; but the lower or older town is irregularly constructed, and its streets are narrow. The river *Somme*, which traverses it, is navigable for small craft. There is a citadel, but the ramparts have been demolished, and now serve as promenades. The chief buildings are—the town-house, built by Henry IV., in which is a collection of paintings of the French school; the corn market, college, and cathedral, one of the finest specimens of Gothic architecture in Europe. It was begun in 1220, but not completely finished before the end of the fourteenth century. The nave of this edifice, the loftiest in France, is regarded as a masterpiece; and the lightness of the pillars attracts much admiration. Dr. Whewell, indeed, went so far as to affirm that the interior is one of the most magnificent spectacles that architecture has ever produced. The central spire is 422 feet high, 18 feet higher than Salisbury; but its height fails to impress the beholder, owing to the loftiness of the roof from which it springs. Amiens also contains a university academy, a college, a school of medicine, a public library of 50,000 volumes, a botanic garden, and several literary and scientific societies.

The trade of Amiens is considerable, and is much facilitated by the *Somme*, which passes through the town in eleven branches, thus gaining it the title of "Little Venice" from Louis XI. By this means essential service is rendered in turning the water-wheels of many of its numerous manufactories. Velvet, plush, camblet, quilting, serge, druggot, fine kerseymer, hosiery, and other goods, linen, cotton, and woollen, are either entirely manufactured, or, being brought to Amiens from other places in an unfinished state, are prepared for sale or for exportation by the resident artisans. There are also paper mills and bleaching grounds. The town serves as a mart for the numerous manufactures of the neighbourhood, as far as the confines of the department. Amiens is also famous for its duck pies, which are largely exported.

The Spanish troops, disguised as peasants, captured the city by stratagem on 10th March, 1597. During the war between Germany and France, in 1870-71, the French were defeated near here on 26th November, 1870, and the city was occupied on the following day by General Manteuffel. The Germans retained possession of it till the conclusion of peace. Peter the Hermit, Ducange the author, and Delambre the astronomer were born here. Statues have been erected to the two former. The population in 1882 was 70,000.

AMIENS, TREATY OF, the treaty of peace between Great Britain on the one part, and France, Spain, and Holland on the other, signed at Amiens on the 25th of March, 1802. The preliminaries of this peace had been signed at London on the 1st of October, 1801; and on that occasion it was agreed that the terms of the final treaty should be settled at Amiens. The Marquis Cornwallis was the plenipotentiary for England, Roger Jean Schimmelpennink for Holland, Don Joseph Nicholas D'Azara for Spain, and Joseph Bonaparte for France.

The treaty of Amiens consisted of twenty-three articles, including the supplementary one. France agreed to evacuate Naples and the Papal States; England, on her part, gave up all her conquests during the war to the powers to whom they had formerly belonged, with the exception of Trinidad, which had been taken from Spain, and the part

of Ceylon which had been possessed by the Dutch. Egypt was restored to Turkey. It was also stipulated that within three months after the exchange of the ratifications of peace the English troops should evacuate the islands of Malta, Gozo, and Gornio, which should be given back into the possession of the Knights of St. John of Jerusalem, to be held by them on conditions which were enumerated under thirteen heads. It was this last stipulation which afterwards afforded the ostensible ground for the breach between the two principal powers which had been parties to the treaty of Amiens. Hostilities were renewed between France and England by a declaration of war on the part of the latter, on the 17th of May, 1803.

AM'IOU, LE PERE, a learned French Jesuit, and a missionary to China. He was born at Toulon in 1718. Having entered the order of the Jesuits he distinguished himself as much by his natural talents as by his persevering application to study. Being sent by his superiors to the eastern missions he arrived at Macao in 1750, whence he proceeded the following year to Peking. Father Amiot soon won the friendship of the Emperor of China, and he continued ever after to reside at Peking, for the space of forty-four years, till his death in 1794. To his knowledge of the Chinese he added that of the Mantchu language, which he studied at Peking, under a military officer of that nation, and which, as he modestly observes, he found very useful for interpreting many obscure passages in the Chinese writers. Amiot continued to send successively from Peking to Europe the fruits of his assiduous researches in the literature of the country he had adopted; and imparted more information on China and Chinese literature than any of the missionaries who had preceded him. At the same time he had the spiritual direction of the congregation of native Christians in the capital.

AM'LUCH, a seaport and borough in the north part of the island of Anglesey, 15 miles from Beaumaris, and 20 N.E. of Holyhead. The town is included in the Beaumaris district of boroughs, which returns one member to the House of Commons. It has a capacious harbour, cut out of the solid rock, which is protected by a breakwater. There is a good beach suitable for bathing, and the scenery from the cliffs is very romantic. The town contains an Episcopal church, several Dissenting chapels, schools, and a scientific hall. A branch line of the London and North-western Railway terminates here.

Amblew was an insignificant village till 1768, about which time the celebrated and highly productive copper mines of Parys and Mona were discovered in the neighbouring mountains. At one time they gave employment to 1500 men, but are now much less productive. Lead ore, rich in silver, has also been found in Parys Mountain. In addition to the mines there are some large chemical and manure works near the town. The population of the parish in 1881 was 4847.

AMMANATI, BARTOLOMME'O, sculptor and architect, was born at Florence in 1511, and bred in the very height of the golden age of Italian art. Baccio Bandinelli and Sansovino were his tutors. Ammanati became one of the most devoted admirers and imitators of Michael Angelo, and like many other painters and sculptors, catching chiefly the defects of his style, fell into the error of treating the limbs as the most essential part of man. Ammanati was much employed in Rome by several popes—by Paul III., Julius III., and afterwards by Gregory XIII. During the interval between the two periods that he was employed by these pontiffs, he attained great fame at Florence as an engineer and an architect. He constructed the celebrated *Ponte della Trinità*, which spans the Arno in three light and elegant elliptical arches, calculated to allow the sudden floods of that river to pass without the slightest risk. It still exists, and firmly withstood, in 1844,

the most impetuous flood that has visited the Arno for centuries, in which even the then newly-constructed iron suspension bridge was swept away. His wife was the celebrated Laura Battiferri, of Urbino, distinguished as a poetess. Ammanati survived her three years, and died, according to Baldinucci's copy of the inscription on his monument, in 1592, aged eighty-one.

AMMANN, JOHANN, a German physician and botanist, was born at Schaffhausen in 1707. He prosecuted the study of medicine at Leyden, under the celebrated Boerhaave. In 1730 he visited London, and was elected a fellow of the Royal Society in 1731. In 1733 he was appointed professor of botany and natural history at St. Petersburg, and became a member of the Imperial Academy of Sciences there. His herbarium is now in the museum of that city. He published a work on the rarer Russian plants, and contributed several important botanical memoirs to the Transactions of the Academy. A genus—*Ammannia*, in the natural order Lythraceæ—has been named in honour of him. He died at St. Petersburg in 1741.

AMMANN, PAUL, a German physician and botanist, was born at Breslau on 31st August, 1631. He pursued his medical studies at different German universities, took the degree of doctor of medicine at Leipzig, and in 1661 was admitted into the *Academia Cæsarea Naturæ Curiosorum*, the chief natural history society of Germany. He became professor of medicine, and subsequently of botany and physiology at Leipzig. Ammann was an able writer, and a man of extensive learning. He seems, however, to have been of a caustic turn of mind, and disposed to be harsh in his criticisms. Though he wrote several medical works, his fame as a writer is chiefly connected with his botanical publications.

AMMELIDE ($C_6H_5N_3O_3$), a substance obtained from melamine. It is a white powder, insoluble in water, alcohol, and ether, but soluble by the alkalies and strong acids.

AMMELINE ($C_6H_5N_3O_3$), a substance obtained by the action of hydrochloric acid on melamine. It is of a splendid white colour, and is composed of very fine silky needles; it is insoluble in water, alcohol, and ether, but soluble in the caustic alkalies. When fused with hydrate of potash, ammeline is converted into ammonia and cyanide of potash.

AMMIANUS MARCELLINUS, a soldier and author who lived in the fourth century, and wrote a history, in the Latin language, of the emperors, from the accession of Nerva, A.D. 96, to the death of Valens in 378. His history commenced where that of Tacitus ended. Ammianus was of Greek family, and probably born at Antioch (*Lucianus "Ep."* 983). At an early age he entered the army, in the service of the household guards of Constantine, son of Constantine. Constantine reigned in conjunction with Constantine, from 319 to 350. Ammianus served under Ursicinus in Gaul, where he probably got that information about the Gauls which is contained in the fifth and sixth books of his history. He accompanied Ursicinus in the expedition against the Persians. In the reign of Julian, he was engaged in the Persian wars of that emperor. He died also under the successors of Julian, and survived the accession of Theodosius I. in 379. If the letter of Libanius above referred to is addressed to this Ammianus, he was then living at Beroë, and it appears, from passages in his own work, that he had been there. Of the twenty-one books of the history of Ammianus the first ten are lost. The fourteenth book begins just before the death of Constantine, and the transactions of the reign of Julian extend nearly to the end of the twentieth. The question whether Ammianus was a Christian or a pagan has been agitated. Though he has not expressly stated his sentiments, the most probable conclusion from his own work is that he was not a Christian. In style he is inflated; but passages of considerable effect and elo-

quence occur in his work, which has every appearance of being a faithful narrative of public transactions, in many of which he had been personally engaged. "It is not without sincere regret," says Gibbon, "that I must now take leave of an accurate and faithful guide, who has composed the history of his own times, without indulging the prejudices and passions which usually affect the mind of a contemporary" (chap. xxvi.). The edition of J. Gronovius (Leyden, folio, 1693) contains the prefatory matter of the Valesii. The last great edition, with the notes of various critics, is by Wagner and Erfurd (Leipzig, 1808); and the most recent is by Eyssenhart (Berlin, 1872, 8vo).

AMMIRATO, SCIPIONE, called *Il Vecchio* (the Elder), an Italian author, canon of the Cathedral of Florence, was born in the Neapolitan town of Lecce in 1531; died in 1601. His works, which are very numerous, are generally of a historical character. The chief of them are—"Istorie Fiorentine" (which he was commissioned to write by Cosmo I.), in two parts, the first extending to the year 1434, the second to 1571. This, up to the date mentioned, has been pronounced the most complete and exact history of Florence which we possess.

AMMODYTES. See LAUNCE.

AMMON, AMUN, or AMN RA, the name of an Egyptian deity, whom the Greeks considered as synonymous with their Zeus (Jupiter). He is often represented on the monuments of Egypt, and on other works of Egyptian art, with a ram's head and a human body, about which Herodotus (ii. 42) tells an odd story. The two chief Ammonian temples which now exist are that at Carnæ, on the east side of the Nile, forming part of the extensive ruins of Thebes; and that of Siwah, in the Libyan Desert, known to the Greeks by the name of Ammonium.

The god Ammon appears also under the figure of a criosphinx or ram-sphinx, which is an animal with a ram's head and the body of a beast of prey of the feline species.

The city or portion of Ammon is mentioned in Jer. xlv. 25; Ezek. xxx. 15, under the name of Amon-No; and in Nahum iii. 8, under the name of No-Ammon. This city is generally supposed to be the Greek Diospolis, or "city of Jupiter," now forming part of the ruins of Thebes. But the No of Nahum is more probably the Diospolis of the Delta.

The name Ammon forms a part of the proper name of several Egyptian kings and persons.

AMMONIA (*volatile alkali*), NH_3 , a gas which was noticed by Raymond Lully in the thirteenth century, and by Valentine in the fifteenth; it was further described by Kunckel in 1677, still later by Dr. Black in 1756, and was first isolated by Priestley in 1774. Ammoniacal salts were manufactured by the ancient Egyptians. Ammonia occurs naturally in various combinations in the atmosphere, in the water of the sea, and of certain mineral springs; in peat-earth, clay, and iron ores; in the sal-ammoniac evolved from volcanoes, and in many animal and vegetal fluids. It is formed on the electrolysis of water holding common air in solution; when its elements, oxygen and nitrogen, are brought in contact in the nascent state; and on the decomposition of nitrogenous organic matter. It is generally prepared in the laboratory by mixing 1 part of sal-ammoniac (chloride of ammonium) with 2 parts of finely-powdered lime, and gradually heating the mixture in a glass or iron retort. The gas must be collected over mercury, as it is absorbed by water. When submitted to intense cold and great pressure ammonia may be obtained as a liquid—which must not be confounded with the ordinary solution of ammoniacal gas in water—and even as a solid. As a gas it is colourless, of specific gravity 0.5967, of a pungent odour, irrespirable, feebly combustible, of an alkaline taste, reddens turmeric, and turns red litmus blue. It is composed of one equivalent of nitrogen and three of hydrogen;

four volumes of the constituent gases being on combination condensed into two.

Ammonia is absorbed by recently-ignited charcoal, by organic matter in a state of fine division, and by water. Water absorbs 670 times its bulk, or nearly half its own weight of the gas. During the process it increases in volume, disengages heat, and when thoroughly saturated falls to a specific gravity of 0.859. The solution is commonly known as liquor ammoniac, liquid ammonia, spirits of hartshorn, or, in a dilute and impure state, washing liquor. It is a colourless, transparent liquid, of the same colour and taste as the gas, and is used to a large extent in the arts, especially in scouring wool and woollen fabrics, in dyeing and colour-making, in the treatment of certain metallic ores, as well as in analytical chemistry, and in medicine—in which latter art it is employed internally as a stimulant, as a counter-poison to the bites of serpents (Professor Halford, in Australia, has effected many cures by injecting it into the veins), and in zymotic disease.

Gas liquor is the chief source of ammonia and its compounds. The gas liquor is run into a capacious retort, and a suitable quantity of slaked lime added, the amount being determined by the quality of the crude liquor; heat is then applied, and ammonia, tolerably pure, distils over, which on being received in a vessel of cold water forms an ammoniacal liquor. When considerable quantities of steam are observed to pass over with the vapour of ammonia, the strong alkaline solution already formed is removed; that which is collected afterwards, by continuing the distillation, is weak or impure, and is returned to the boiler with a second charge of lime and crude liquor to undergo another distillation. The first portion from the previous operation is redistilled with a small quantity of lime; its product is a concentrated liquid of sufficient purity for all ordinary purposes of scouring, cleaning, &c., but it may be still further improved by a third distillation. The stills used are those employed in the distillation of alcohol.

Ammonia is also prepared from gas liquor by saturating it with brown oil of vitriol, and more or less thoroughly purifying the sulphate of ammonia thus formed by crystallization. It is then mixed with lime and heated in large iron cylinders, and the ammoniacal gas disengaged is absorbed by water put in large three-necked stoneware receivers, which are carefully cooled. The principal impurities found in ordinary commercial ammonia are sulphuretted hydrogen, tarry matter, and traces of aniline and other organic bases.

Ammonia combines readily with acids, forming a series of salts analogous to those of potash. They are all soluble in water, and are volatilized by heat, except the acid be fixed like the phosphoric. In this case the ammonia alone is driven off, leaving the acid free. The fixed alkalies, alkaline earths, and certain metallic oxides decompose ammoniacal salts, setting ammonia free, which may be recognized by its odour, by its action upon turneric paper, and by the white vapour formed on holding over the mixture a glass rod moistened with hydrochloric acid.

Concentrated solutions of ammoniacal salts give a yellowish, granular, crystalline precipitate with bichloride of platinum, and with tartaric and picric acids. A considerable time often elapses before these precipitates make their appearance. The ammoniacal salts form numerous double salts with the salts of sodium, potassium, magnesium, aluminium, and the oxides of magnesium, zinc, cobalt, nickel, &c.

Acetate of ammonia ($C_2H_5O_2.NH_4$) is formed by neutralizing dilute acetic acid with carbonate of ammonia. Transparent prismatic crystals, very deliquescent.

Ammonium carbonate.—With carbonic acid ammonia forms a considerable number of salts. We mention merely the *sesquicarbonate* ($C_3O_3.N_4H_{10}+2H_2O$), or common commercial carbonate of ammonia, formerly known as *sal-*

volatile or *volatile salt of hartshorn*, prepared on the large scale by the dry distillation of bones, hartshorn, and other animal matter. It is a white, semitransparent, fibrous substance, with a pungent caustic taste and a strong ammoniacal smell. Exposed to the air it is converted into the acid carbonate (CO_2NH_4H). It is completely volatile; its aqueous solution is strongly alkaline, and is used in medicine as a stimulant.

Chloride of ammonium or *sal-ammoniac* ($ClNH_4$) is formed from commercial carbonate by addition of hydrochloric acid; in some works the carbonate is first converted into the sulphate by filtering in solution through gypsum (calcium sulphate). This liquor is mixed with chloride of sodium evaporated to dryness, and the sal-ammoniac separated by sublimation. It forms tough fibrous cakes, but can likewise be obtained in fine crystals of a cubic form. This salt is used in medicine and in dyeing; iron filings and sulphur, moistened with a solution of it, form a cement for fixing iron to stone. In the crude state it is employed as a manure.

Ammonium chloride is extensively produced as a by-product in the manufacture of bone charcoal. The bones are distilled in iron retorts very similar to those used in gasworks for the distillation of coal. The condensed products are discharged into a tank, where the oil collects on the top in a layer and is skimmed off, leaving the ammoniacal liquor, to which hydrochloric acid is added in proper proportion, till the solution is neutralized. The liquid is then freed from hydrocarbons by filtration, and transferred to evaporating pans to be concentrated. As soon as the liquid acquires a certain gravity it is drawn off to the crystallizing pans—wooden boxes, lined with sheet lead, of considerable size. When the mass of salt is crystallized the liquor is drained off, and the chloride of ammonium when dry sublimed in earthen or stoneware pots.

Sulphate of ammonia ($SO_4(NH_4)_2$) is obtained by neutralizing the ammoniacal liquor of the gas-works with sulphuric acid. It is extensively employed in agriculture, and serves also as a source for obtaining all other compounds of ammonia. In 1869 Professor G. Villa, of the Jardin des Plantes, Paris, ascertained that sulphate of ammonia existed in considerable quantities in the lakes of Tuscany—the water in one of them containing as much as 48 per cent. of it.

Nitrate of ammonia (NO_3NH_4).—This salt, produced by the action of nitric acid on ammonia, is in the form of slender crystals; colourless, inodorous, very sharply saline to the taste, readily soluble in water, and deliquescent in a moist atmosphere. When heated, nitrate of ammonia is decomposed, and is resolved into water and nitrous oxide gas. Thrown into a red-hot crucible it burns with a pale yellow flame. It is principally used for preparing nitrous oxide gas.

Oxalate of ammonia ($C_2O_4(NH_4)_2$, produced by the action of oxalic acid, is in the form of small prismatic crystals; they are devoid of smell, have a bitter saline taste, and dissolve readily in water. It is used as a test of the presence of lime, and to precipitate it from solution in chemical analysis.

AMMONIAC, a concrete juice or gum procured in Persia and other parts of the East, from a plant called *Dorcma ammoniacum*. This plant belongs to the order Umbellifera; it grows from 7 to 9 feet high, has large doubly pinnate leaves, and is full of a milky juice, which oozes out at the slightest puncture, and hardens in the form of drops or "tears." The gum-resin is sold either pure in tears, or in lump mixed with the fruits of the plant and other impurities. The smell is peculiar and disagreeable, and the taste is nauseous, at first mucilaginous and bitter, and afterwards acid. When distilled with water it loses its volatile oil, and becomes inodorous; the distilled

water has the odour of the gum, and small drops of limpid colourless oil float on its surface. According to Hagen, ammoniac consists (in 100 parts) of 68·6 parts of resin, 19·3 parts of gum, 5·4 of gluten, 2·8 of volatile oil and water, 3·9 of extractive, &c.

The official form for administering this gum is the *mixture*, in which it is partly dissolved and partly suspended in water. It is a most valuable expectorant. Dilute nitric acid greatly heightens its powers. It is also an ingredient in the compound squill pills. Externally, either softened with vinegar or combined with mercury, it is applied as a plaster to disperse indolent swellings.

The ammoniac of the ancients is said to have been derived from a nearly allied plant, *Ferula tingitana*, and this may be the source of *African ammoniac*.

AMMONITES is the name given to a genus of extinct *CEPHALOPODA* nearly allied to the pearly nautilus. The name was given from the resemblance of the beautiful shell to the ram's-horn decorations which symbolically enriched the front of the temple of Jupiter Ammon, and the bas-reliefs and statues of that deity. Like the nautilus, the ammonite had an external shell composed of an outer porcellaneous layer and an inner mother-of-pearl layer. This shell is of a flat disc-like form, having its surface strengthened and ornamented with ribs, and inclosing a series of chambers formed by transverse plates intersecting the inner portion of the shell. A tube, or *siphuncle*, begins at the bottom of the outer chamber, and perforates the entire series of chambers to the innermost extremity of the shell. The nautilus is found at a depth of from 200 to 300 fathoms, and so much more strongly built is the shell of the ammonite that it appears to have been capable of living at greater depths. The entire shell is one continued arch—and no form is better fitted to resist superincumbent pressure—coiled spirally upon itself in such a way that the base of the outer whorls rests upon the corner of the inner ones; and the keel or back is thus calculated to resist weight, on the same principle that the shell of a common hen's egg will endure considerable force, if that force be applied in the direction of its longitudinal diameter. The shell is further strengthened by the insertion of *ribs*, or transverse arches, which give to many of the species their characteristic feature, and in all produce that peculiar beauty which, for every artist's eye, invariably distinguishes the symmetrical repetition of a series of spiral curves. From the disposition of these ribs over the surface of the external shell, mechanical advantages are obtained for increasing its strength, founded on a principle that we see everywhere practically applied in works of human art and science—the principle, namely, by which the strength and rigidity of a flat plate of metal are considerably enhanced by corrugating, or fluting, the surface. The general principle of dividing and subdividing the ribs, in order to multiply supports as the vault or luges, is conducted nearly upon the same plan, and for the same purpose, as the division and subdivisions of the ribs beneath the groin work in the flat vaulted roofs of the later Gothic architecture. But many species of ammonites are further strengthened by the elevation of parts of the ribs into little dome-shaped *tubercles* or *bosses*, thus superadding the strength of a dome to that of the simple arch, at each point where these *bosses* are inserted. This contrivance was also been imitated by the Gothic architects, who have applied the *bosses* to the intersections of the ribs in their highly ornamented roofs. The transverse plates also increase the strength of the external shell by multiplying the subcent points of resistance to outward pressure. The use of the internal chambers has been much discussed, and the question has not been yet decided. Though the shell of the pearly nautilus is well known, the animal itself is very rare, only one having been obtained during the *Challenger* expedi-

tion. The nautilus has been seen after storms floating in shoals at the surface of the ocean, and after a time disappearing again in the depths. It has been conjectured that the chambers are filled with sea water until the animal wants to rise towards the surface, when they are gradually emptied of the water and filled with air by means of the siphuncle.

As many as 700 species have been enumerated. They range from the triassic formations to the chalk, and are reported from Chili, Santa Fé de Bogota, New Jersey, Europe, Southern India, and New Zealand. For illustration, see *Plates* to article *GEOLOGY*.

AMMONITES, a nation descended, according to Gen. xix. 38, from the incestuous connection of Lot with his younger daughter, about the year 1898 B.C. The name of their progenitor, Ben-Ammi, means "son of my kindred," and the name Ammon has nearly the same signification. The Ammonites, or the children of Ammon, are called Ammanites by the Septuagint and Josephus. The country which they inhabited was situated between the rivers Arnon and Jabbok, N.N.E. of the Moabites, and E. of the tribes of Reuben and Gad. The Israelites were directed on their settlement in Palestine not to distress the children of Ammon, because the Lord had given the land unto the children of Lot for a possession; but several wars arose between the people subsequently, for which we must refer the reader to the Pentateuch and the other books of the Old Testament, and also to Maccabees. In the days of Justin Martyr the Ammonites were still very numerous; and in the time of Origen the Ammonites and Edomites went under the general name of Arabians (Polyb. lib. v). Their metropolis was Rabbah. The surrounding country was called Arabia Philadelphiensis.

The Ammonites were uncircumcised (Jer. ix. 26), and worshipped Moloch or Milcom, and their idolatry was introduced among the Israelites by the Ammonitish wives of Solomon (1 Kings xi. 7, 33; 2 Kings xxiii. 13).

Of their kings we know only Nahash and Hanun, in the time of David, and Baalis, contemporary with Nebuchadnezzar (Jer. xl).

AMMONIUM (NH₄), a name given by Davy, Berzelius, and other chemists, to a supposed metallic base of ammonia, the oxide of which (ammonia, NH₄O) combines with acids, in the same way as the oxides of the metals, to form the salts of ammonium. Ammonium salts are formed by bringing ammonia or carbonate of ammonia directly into contact with acids. Another hypothetical compound, closely connected with ammonia, received the name of *amidogen* (NH₂), but ammonia has been found capable of exchanging each of its atoms of hydrogen for a metal or compound radicle; and all these compounds are now termed *amides*. They form a numerous and complicated series of salts.

AMMONIUS SACCAS, the founder of the Neo-Platonic school of philosophy, lived at Alexandria during the first part of the third century, and died there 241 A.D. His origin was humble, and his surname was derived from his having been in early life a porter or sack carrier in the market. He was born a Christian, but is generally believed to have severed his connection with the church, though this has been disputed. His most famous pupils were Herennius, the two Origenes, Longinus, and Plotinus—the latter of whom declared himself to be the mere exponent of his master. He endeavoured to unite the principles of Plato and Aristotle, and adopted some of the teachings of the Indian and Persian philosophers, but as he wrote nothing himself it is difficult to ascertain the principles of his system.

AMMUNITION, strictly speaking, means "military stores," but in the usual acceptance of the word it refers only to the powder and shot used in ordnance and rifles.

In its general use the significance of the word is even narrower, being almost always understood as applying to the charges for rifles, whether for military or sporting purposes. The character of the ammunition is a matter of as much concern to the gunmaker or the person using a gun as the construction of the weapon itself. The best gun or rifle may be rendered useless by an excessive or defective charge; in fact, faulty ammunition may render a weapon more dangerous to the user than to the object aimed at. The quality and granulation of the powder to be used, and its relative proportion in weight to the projectile, are therefore questions connected with ammunition that are of vital importance in the science of GUNNERY, and will be dealt with in our article on that subject. The *weight* of ammunition has become a serious matter of late years, since the introduction of breech-loading rifles capable of firing from nine to fifty times per minute. Repeating rifles can exceed even this rapidity, and may shoot off in one minute a quantity of ammunition equal to the entire amount carried into action by an infantry soldier. Part of the modern tactics of war relate, therefore, to the best way in which ammunition trains are to be kept within easy reach of an attacking or defending force, in order to secure a prompt supply of ammunition to the men engaged. An incessant and never-failing supply of ammunition enabled the Turks at Plevna to hold a roughly extemporized fortress against overwhelming numbers, and the failure of ammunition lost Majuba Hill and gave the Transvaal Boers an important victory over British arms. At the time of the campaigns of 1864 and 1866, when breech-loading rifles first came into prominent use in warfare, the Prussian soldier carried only sixty rounds of ammunition—forty in his pouch and twenty in his knapsack. He can now carry ninety-two rounds, the weight having been greatly reduced. The French can carry the same quantity, but about seventy rounds is the maximum which the British soldier can carry for his Martini-Henry—the cartridges being considerably heavier.

AMNESTY is a word derived from the Greek *amnesia* (*amnesia*), which literally signifies nothing more than non-remembrance. The word *amnesia* occurs in Plutarch and Herodian.

The notion of an amnesty among the Greeks was a declaration by the person or persons who had newly acquired or recovered the sovereign power in a state, by which they pardoned all persons who composed, supported, or obeyed the government which had been just overthrown. A declaration of this kind may be either absolute and universal, or it may except certain persons specifically named, or certain classes of persons generally described. When Bonaparte returned from Elba in 1815 he published an amnesty, from which he excluded thirteen persons, whom he named in a decree published at Lyons. The act of indemnity passed upon the restoration of Charles II. by which the persons actually concerned in the execution of his father were excluded from the benefit of the royal and parliamentary pardon, is an instance of an amnesty from which a class of persons were excepted by a general description. Of a like nature was the law passed by the French Chambers in January, 1816, upon the return of Louis XVIII. to the throne of France after the victory at Waterloo, which offered a complete amnesty to "all persons who had directly or indirectly taken part in the rebellion and usurpation of Napoleon Bonaparte," with the exception of certain persons whose names had been previously mentioned in a royal ordinance as the most active partisans of the usurper.

AMEBA (from *ambiōn*, to change) or Proteus-animalcule is an exceedingly minute organism belonging to the class RHIZOPODA and the subkingdom PROTOZOA.

It is found in stagnant water, mud, or any place where there is decaying matter, and is probably the lowest form of living things. Indeed its structure is so elementary that Professor Huxley said that it is "structurally a mere colourless blood corpuscle leading an independent life." Its body is a microscopic speck of a jelly-like substance called "protoplasm," without any skin or distinct parts. Protoplasm is the element of all life, vegetable and animal. Every living thing begins its existence in the form of an ameba, as a mere speck of protoplasm, and grows by constant division and change of form of various cells set apart for special purposes. Accordingly, Hückel and other evolutionists trace the origin of all living things to an amoeboid form, the Monera. Protoplasm is composed of the four elements—hydrogen, oxygen, carbon, and nitrogen. The body consists of an outer layer and an inner. The latter is full of granular particles, which are constantly streaming about in the body. In the midst of these particles is found a granular body surrounded by a thin film. This is called the "nucleus." In most amebæ there may be noticed in the inner layer a small round clear space (to which the name of "contractile vacuole" has been given), which contracts and expands at regular intervals, presenting the appearance of a window opening and shutting. The part this plays in the economy of the ameba is not by any means certain, but in all likelihood it performs the office of a kidney. Motion is brought about by putting out in a certain direction finger-like portions of the outer layer; the rest of the body then pushes after the "pseudopodia," as they are called. The ameba has no mouth, food being taken in through the general mass. As the animal moves a part of the body comes into contact with small particles of food, which instantly sink in through the viscid outer layer. The solid matter which cannot be digested is cast out through the body in the same way. Reproduction may be effected by the ameba either splitting up into two separate organisms, or casting off a "pseudopodium," which becomes a distinct animal. Sometimes the ameba suddenly abandons his roving life, settles down as a large spherical mass, after some time bursts, and gives exit to numerous little bodies which become perfect amebæ.

AMOL or **AMUL**, an unwall'd Persian town in the province of Mazanderan, stands on the river Heraz, about 12 miles from the southern shore of the Caspian Sea. The stream, which is full and rapid, is crossed by a bridge 8 feet wide, which has twelve arches. Amol is divided into eight districts. Many of its inhabitants in summer quit the city to tend their flocks; but in winter, when it is fullest, the population is estimated at 40,000. The bazaars are large and well supplied; but the only traffic carried on is with the country and villages in the immediate vicinity. The Elburz Mountains approach close to the town on the south. The space between it and the sea is thickly covered with woods, among which there are many groups of houses, but no regular roads. In the neighbourhood are some splendid ancient ruins.

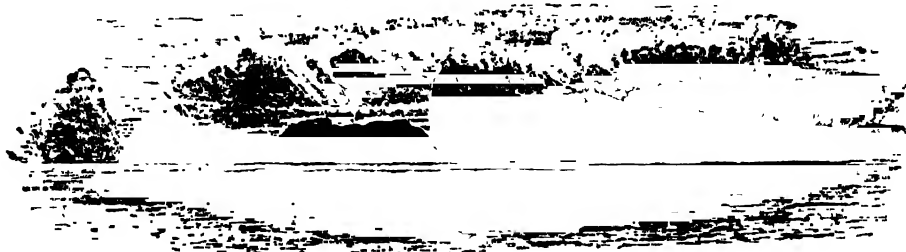
AMOMUM, a genus of plants bearing aromatic seeds. The GRAINS OF PARADISE, MELLAGETTA PEPPER, and some CARDAMOMS of the shops, a class of highly aromatic pungent seeds, are produced by species of Amomum. The genus belongs to the ginger order, ZINGIBERACEÆ. The stems are perennial; the leaves are alternate, sheathing at the base; the flowers spring from the creeping root-stock, and are arranged in cone-like clusters, not rising high from the ground; the corolla has a large flat lip without inner side lobes; the filament of the single stamen is produced beyond the two-celled anther; the capsule is three-celled, opening by three valves.

Round or cluster cardamoms are derived from *Amomum Cardamomum*, a native of Sumatra, Java, Siam, and Cambodia. The seeds have a taste of camphor, and although

they are not at the present day brought to Europe, they are an article of considerable traffic in Eastern Asia. The cardamoms imported into this country are the produce of *Elettaria Cardamomum*.

AMoor or **SAGHAL'YEN**, one of the largest rivers of Asia, formed by the union of the Argun and Shilka. The remotest branch of the latter is the river Onon, which has its source in 110° E. lon., and 50° N. lat., and is itself formed by the Ingoda, the Erguné, and other rivers. The Argun, or as it is called before flowing through Lake Kulon, the Kerulen, joins the Shilka at a place called Ust Strelkoi. These streams both take their rise in the Khingan Mountains, near the confines of Siberia and China. The united river thus formed, called the Amoor, flows for some dis-

tance north-eastward, then northward through a mountain region called King-gan Yalo; and after following a very tortuous path it enters the Sea of Okhotsk, in about 53° N. lat. The whole course of the Amoor, from the sources of the Onon to its mouth, amounts altogether to nearly 2500 miles, owing to the great and frequent changes of its direction; in a straight line the sources and mouth are only about 1330 miles distant from one another. It is a rapid stream, abounding in fish, and is navigable for steamers of light draught to the junction of its two branches, although for several months in the year it is frozen over. The upper part of its basin is a barren country, but in the lower part it has many fertile regions. The chief tributaries of the Amoor on the right bank are the Gungari, believed by the



Danger Rocks near the Mouth of the Amoor.

Chinese to be the proper source, and the Usuri; while on the left bank it is fed by the Zeya, the Bureia, the Gyrin, and the Onogun.

AMoor, a region of Eastern Asia, on the Pacific, which has been gradually absorbed by Russia since the sixteenth century. By the terms of a treaty with China in 1861, all the region north of the Amoor and east of the Usuri rivers, from Cape Ladio in the Sea of Japan, belongs to Russia. The Russian territory is divided into the province of Amoor and the maritime province of Eastern Siberia, separated by the Khingan and Vanda Mountains. The area of the province of Amoor is 164,000 square miles; of the whole territory, 744,715 square miles. The population is 45,000. Most of the trading places in the interior are on the banks of the Amoor. The principal places on the coast are Victoria Bay, Port Seymour, Vladimír Bay, Constantinovsk, Alexandrovsk, and Nicolayevsk. In Passiett Bay, where the Chinese, Russian, and Korean frontiers meet, there is a large trading town and military station. Further north lies the important harbour of Vladivostok, or Port May, now the capital of the Amoor provinces, and connected by the China submarine cable with Europe.

AMORITES, the most powerful tribe of the Canaanites, or the aborigines of Palestine. The name Amorites seems sometimes to be used for all the Canaanites, who were the descendants of Ham, through Canaan, Sidon, and Heth (Gen. x. 15-20). The Amorites are mentioned among the ten nations whose country was given to the seed of Abraham (Gen. xv. 19-21). They dwelt chiefly in the mountains, which afterwards belonged to the tribe of Judah (Num. xiii. 29; Deut. i. 20). Some Amorites lived in the plains bordering upon the tribe of Dan, and others between the rivers Jordan and Arnon. The river Arnon was the border between Moab and the Amorites (Num. xxi. 13). Of the cities of the Amorites it was said to the people of Israel, "Thou shalt save alive nothing that breatheth: but thou shalt utterly destroy the Hittites, Amorites, Canaanites, Perizzites, Hivites, and Jebusites, as the Lord thy God hath commanded thee, that they teach you not to do after all their abominations, which they have done unto their gods" (Deut. xx.

16-18.) "Even their sons and their daughters have they burnt in the fire to their gods" (Deut. xii. 31). "Whoever of the children of Israel or of the strangers that sojourn in Israel, giveth of his seed unto Moloch shall be put to death" (Lev. xx. 2). But though often suffering severe losses they were not extirpated, but remained in the mountains in considerable force; for in 1425 B.C. they forced the tribe of Dan into the mountains (Judges i. 34-36), and even in the time of the Maccabees they formed a distinct tribe (Josephus, "Antiq. of the Jews," xiii. chap. 1).

The Amorites were of tall stature. According to Amos (ii. 9) they were high as cedars and strong as oaks. The Amorite king, Og of Bashan, is recorded as a giant, whose bedstead was 9 cubits by 4 (Deut. iii. 11). The rabbins have some wild legends respecting him. The inhabitants of Gibeon were Amorites (Josh. ix.).

AMORPH'ISM, **AMORPH'OUS**, are substantive and adjective terms, derived from the Greek *a*, without, and *μορφή*, form, and used in chemistry and mineralogy to signify that certain physical properties are not limited to certain definite lines or planes. Thus the amorphous substance conducts heat equally in all directions; there are no planes of cleavage as in crystals, or no definite crystalline form. Graphite, forming the black-lead of pencils, is an amorphous form of the diamond, a crystal of carbon.

AMOS, the prophet, was a native of the town of Tekoa, which was about 6 miles south of Bethlehem. He was not a prophet's son, but a herdsman, and a gatherer of sycamore fruit; and the Lord took him, as he followed the flock, to prophesy unto Israel (Amos vii. 14, 15). Amos saw his visions concerning Israel in the days of Uzziah, king of Judah, and of Jeroboam II., king of Israel, two years before the earthquake (about B.C. 784). This earthquake is mentioned by Zechariah (xiv. 5), "Ye shall flee, like as ye fled from before the earthquake in the days of Uzziah, king of Judah." Both Jewish and Christian authorities recognize the canonical character of his prophecies.

Many having repeated St. Jerome's saying, that Amos "was rude in speech, but not in knowledge," Bishop Louth, in his twenty-first lecture, shows that Amos was not behind the chief prophets in eloquence. The book of Amos

is written in an excellent Hebrew style, but the orthography differs occasionally from the usual standard. Amos, the herdsman, has taken many figures from pastoral life, but he alludes also to history, geography, and astronomy.

AMOU DARIA. See OXUA.

AMOY, a city and port of China, on an island of the same name, near the coast, in the province of Fokien. The name is a corruption of the native word *Heamun*. The district directly adjacent to this flourishing town, the emporium of the commerce of the province, is one of the most barren in all China; so that Amoy is dependent for the necessities of life upon the more distant parts of Fokien, and on the neighbouring island of Formosa, which has been described as the granary of the eastern coast of China. Notwithstanding this serious disadvantage the merchants of Amoy are among the most wealthy and enterprising in the Chinese empire; they have formed connections all along the coast, and have established commercial houses in many parts of the Eastern Archipelago.

During the south-west monsoon the merchants of Amoy freight great numbers of their smaller junks at Formosa with sugar and rice, which they sell at various ports to the northward, returning home with cargoes of drugs. Above 300 junks of the largest class—some of them 800 tons burden—belong to Amoy, and trade with Borneo, Manilla, Macassar, Java, the Soo-loo Islands, Singapore; and with Bangkok, the capital of Siam.

Amoy is a large city, 8 or 10 miles in circumference, and is divided into two parts, an inner and an outer town. These are separated by a chain of rocks crossed by a paved road, upon which ridge a strong citadel has been built. This defence, which is itself a mile in circuit, commands the city as well as the outer town. The city is bounded for nearly its whole length by the inner harbour, which is one of the best on the coast, and an estuary which deeply indents the island. The entrance into the outer harbour, which has a secure anchorage, is by a passage 600 yards across between the islands of Amoy and Ku-lang-su. On each side of this entrance, and of both the harbours, there are strong fortifications. There are some large dry docks, and shipbuilding is extensively carried on. The town has been described as perhaps the dirtiest in the world. In the neighbourhood are a number of tombs, cut out of the solid rock.

Europeans were allowed to trade to Amoy for a few years subsequent to 1675; but in 1681, when this part of China was subdued by the Manchoo Tartar dynasty, which has always shown itself averse to foreign intercourse, the liberty to trade was discontinued. Several attempts were afterwards made to induce the Chinese to admit commerce; but so many obstacles were placed in the way, and such exorbitant duties demanded by the government officials, that notwithstanding the eager inclination of the Amoy merchants, these attempts did not succeed. On the 26th of August, 1841, however, Amoy was captured by the British; and, by the treaty of Nanking, dated 29th August, 1842, this port, among others, was opened to trade, British subjects and a British consul being allowed a residence. By a supplementary treaty, dated 8th October, 1843, a tariff of imports and exports was established, and other foreigners admitted to the same privileges as the British. The chief articles exported are tea, paper, silk, and porcelain; and the imports are rice, sugar, grain, cotton, steel, iron, lead, indigo, and European goods. Opium from India is also imported in large quantities. About half the foreign vessels which enter and clear from the port are British ships trading with other Chinese ports. Amoy possesses water communication with the inland city of Chang-chow, of which it is the port. The population of the city is about 300,000, and of the island, 400,000.

AMPERE, a term generally employed amongst

electricians from about 1828 as a standard measure of the *intensity* of an electric current. It receives its name from the celebrated scientist AMPÈRE. Electricity is measured as to intensity by the ampere, just as water by the pint. Intensity must not be confounded with *quantity* of electricity, the latter being measured by the coulomb. A coulomb is that quantity of electricity which is forced through the resistance of one ohm by a current with the intensity of one ampere in a second. The ohm is the standard of resistance, whereby the resisting powers of different conducting bodies is measured. We may add that a volta, or volt, is the standard of electro-motive force. All these measures bear the names of distinguished electricians; and each has a certain definite test for the property it measures, as accurate and unchangeable as the yard, pint, or pound.

AM'PERE, ANDRÉ MARIE, was one of the many scientific men who, since the commencement of the present century, have distinguished themselves by the application of the highest branches of mathematical analysis in investigations relating to electricity, magnetism, and light. Of his private life little is known; and his history, like that of most of the men who have passed their days in scientific pursuits, consists merely in statements of his birth and death, with a list of the works he composed. He was born in Lyons in 1775, and it appears that he resided in or near that city till about the year 1804, when he removed to Paris, where he died in 1836. Before his removal he was professor of physics in the central school of the department of Ain, and subsequently he held the appointment of professor of analysis in the Polytechnic School of Paris. His first publication is entitled "*Considerations sur la Théorie Mathématique du J u*" (1802).

In September, 1820, Ampère read before the Académie Royale des Sciences a paper in which it was stated that the voltaic pile or galvanic trough, when its opposite poles are connected by a wire, caused a magnetized needle suspended near it to deviate from the magnetic meridian; and soon afterwards he communicated an important discovery, which proved that some at least of the phenomena of magnetism could be represented by electricity alone. He showed that if two wires connect the opposite poles of a battery, they attract one another when so disposed that the currents pass along them in the same direction, and repel one another when the currents flow in contrary directions; and he contrived a delicate apparatus by which the phenomena were exhibited.

He subsequently further investigated the subject, and in 1821 he suggested the possibility of the construction of an electric telegraph, which he proposed should have a separate wire for each letter of the alphabet.

Ampère published at Paris, in 1822, a work entitled "*Recueil d'Observations Electro-Dynamiques*;" in 1824 one which was designated "*Précis de la Théorie des Phénomènes Electro-Dynamiques*" (both of these are in 8vo); and in 1826, in 4to, "*Théorie des Phénomènes Electro-Dynamiques*." Two years afterwards he published a "*Mémoire sur la Détermination de la Surface courbe des Ondes lumineuses, &c.*" and six years subsequently an "*Essai sur la Philosophie des Sciences, &c.*" Besides these works there were published separately several memoirs relating to his experiments in electro-dynamics; also, in the *Mémoires de l'Institut*, in the *Journal de l'Ecole Polytechnique*, and in other works, are many papers relating to mechanics, optics, and natural history.

AMPHIBIA (*ἀμφίβιος*, having a double life). This name, which is popularly applied to any animal whose habits are at once aquatic and terrestrial, was given by Linnaeus to all cold-blooded vertebrates except fishes. It is now restricted to those vertebrates which breathe in an immature state by means of gills, but in which lungs are

always present when adult. In some Amphibia the gills or branchiæ are external, and remain after lungs have been acquired. To these, the most interesting of which are the proteus and the siren, the name *perennibranchiate* (with persisting gills) has been given. The *caducibranchiate* (with perishable gills) include frogs, toads, and newts. The frogs, toads, and the order Urodela in the embryonic state are provided with two sets of gills — external, which are early lost; and internal, which are lost at maturity.

All the Amphibia undergo a metamorphosis — being excluded from the egg with the shape and organs of a fish. Some, as the Cæcilie, in the order ORTHOMORPHA, are eel-like and without limbs, but fins are never present in the adult. The next order, URODELA, amongst which are the Amphiuma, salamanders, and newts, have two pairs of limbs, and also tails; whilst the BATRACHIA, including the frogs and toads, possess a short tailless body with powerful hind limbs. The fourth order of Amphibia, known as LABYRINTHODONTA, and now extinct, existed in the triassic period. According to Huxley, they were salamandrilform, with relatively weak limbs and a long tail. In all the Amphibia the skull articulates with the vertebrate column by means of two occipital condyles.

Though the toad has long been reputed to be poisonous, none of the Amphibia secrete venom. In some cases, however, the skin secretes an acrid fluid, which serves to protect the animal from attack. Respiration is largely effected by means of the skin. The heart consists of a single ventricle, and two auricles in the adult. There are no salivary glands. In every case the young are produced from eggs. Amphibia are distributed all over the world. Darwin, however, notices in his "Origin of Species" that Batrachia are never found in any oceanic island.

AMPHIBOL'OGY (αμφιβόλια, ambiguity, and λόγος, a phrase) is a term used in logic to denote the fallacy of using a sentence admitting of a double construction, and thus making the meaning uncertain. The oracles of Apollo at Delphi and elsewhere furnish the best instances of amphibology. The best known is the oracle given by the god to Pyrrhus, "Αἰε το, Ἐκείδα, Ῥωμαῖοι νικεῖτε ποσέ," which may be rendered either "I say, son of Æacus, that thou canst conquer the Romans;" or "I say that the Romans can conquer thee." On this Shakespeare has modelled the response given by the spirit raised by Eleanor, duchess of Gloucester, in "Henry VI.," "The duke yet lives that Henry shall depose."

AMPHICTYONS (Ἀμφικτιόνες), members of a council in ancient Greece, called the Amphictyonic Council. Amidst the darkness which hangs over its origin we discover with certainty that this was one of the earliest institutions in Greece. No complete account has been given of it during any period of its existence by any ancient writer. The fullest information is supplied by Æschines the orator ("De Falsa Legatione"), who states that the Greek nations which were represented in the council were the Thessalians, Boeotians, Dorians, Ionians, Perinthians, Magnesiensians, Locrians, Ceteans, Phlioths, Malians, Phocians. Each nation was represented by certain sovereign states, of which it was supposed to be the parent; thus Sparta, conjointly with other Dorian states, represented the Dorian nation. Amongst the states thus united in representing their common nation there was perfect equality. It seems probable that each nation, whatever might be the number of its constituent states, had two votes, and only two. The council had two regular sessions in each year, meeting in the spring at Delphi, and in the autumn near Pylæ, otherwise called Thermopylæ; but special meetings were sometimes called before the usual time. From the meeting at Pylæ, a session of Amphictyons was called a Pylæa, and the deputies were called

Pylagoræ. There were also deputies distinguished by the name of Hieromnemons, whose office it was, as their name implies, to attend to matters pertaining to religion. Athens sent three Pylagoræ and one Hieromnemon. The former were appointed for each session; the latter probably for a longer period, perhaps for the year, or two sessions. The council entertained charges laid before it in relation to offences committed against the Delphic god, made decrees thereupon, and appointed persons to execute them. These decrees (Diodorus, xvi. 24) were registered at Delphi. The oath taken by the deputies bound the Amphictyons not to destroy any of the Amphictyonic cities, or to debar them from the use of their fountains in peace or war; to make war on any who should transgress in these particulars, and to destroy their cities; to punish with hand, foot, voice, and with all their might, any who should plunder the property of the god (the Delphic Apollo), or should be privy to or devise anything against that which was in his temple. This is the oldest form of the Amphictyonic oath which has been recorded, and is called by Æschines the ancient oath of the Amphictyons. An ordinary council consisted only of the deputed Pylagoræ and Hieromnemons; but on some occasions at Delphi all who were present with the Amphictyonic deputies to sacrifice in the temple and consult the oracle of the god, were summoned to attend. Besides the list of Amphictyonic nations given by Æschines we have one from Pausanias, which differs a little from it, and another from Harpocration, which differs slightly from both.

We are told by Strabo (ix. 418) that after the destruction of Crissa by an Amphictyonic army, under the command of Eurylochus, a Thessalian prince, the Amphictyons instituted the games which from that time were called the Pythian, in addition to the simple musical contests already established by the Delphians. Pausanias also (x. 7) attributes to the Amphictyons both the institution and subsequent regulation of the games.

The Amphictyonic Council long survived the independence of Greece. So late as the battle of Actium, B.C. 31, it retained enough of its former dignity to induce Augustus to claim a place in it for his new city of Nicopolis. We know from Pausanias (x. 8) that it was in existence in the second century after Christ. For the time of its final dissolution we have no authority.

It is not easy to estimate the effects produced on the Greek nation by the institution of this council. This country was subject to incursions from barbarous tribes, especially on its western frontier. In the pressure of these incursions the Amphictyonic confederacy may have been a powerful instrument of preservation, and must have tended to maintain the separation of its members from their foreign neighbours, and so to preserve the peculiar character of the Greek people. It may also have aided the cause of humanity; for it is probable that in earlier times differences between its own members were occasionally composed by interference of the council; and thus it may have been a partial check on war, or have diminished its miseries. In one respect its influence was permanently beneficial. In common with the great public festivals, it helped to give a national unity to numerous independent states, of which the Greek nation was composed. But it had a merit which did not belong to those festivals in an equal degree. It cannot be doubted that the Amphictyonic laws, which regulated the originally small confederacy, were the foundation of that international law which was recognized throughout Greece, and which, imperfect as it was, had some effect in regulating a moral intercourse among the Greeks in peace and war, and, so far as it went, was opposed to that brute force and aggression which no Greek felt himself restrained by any motive from exercising towards those who were not of the Greek name. To the

investigator of that dark but interesting period in the existence of the Greek nation which precedes its authentic records, the hints which have been left us on the earlier days of this council, faint and scanty as they are, have still their value.

AMPHILA, BAY OF, a bay extending for about 16 miles along the west coast of the Red Sea, in 14° 30' N. lat., and 41° E. lon. It contains thirteen islands, the largest of which, also called Amphila, lying near its south-eastern extremity, is not quite a mile in length. None of them are now inhabited, though on one, called Kutto, there are the ruins of some houses.

AMPHIOXUS. See LANCULET.

AMPHIPOLIS, a Greek city on the east bank of the river Strymon, in Thrace, just below its egress from the Lake Kerkine, now called Takino, and about 3 miles above its influx into the Archipelago. This town was at first called Ennea Hodoi (the "Nine Ways"), and belonged to the Edonians, a Thracian people. The first effort of the Greeks at colonization here was by Aristagoras of Miletus, who failed in the attempt, B.C. 497. The Athenians took Ennea Hodoi 487 B.C., and established a colony to which the name of Amphipolis was given, on account of its being nearly surrounded by the Strymon (Greek, *amphi*, around; and *polis*, a city). During the Peloponnesian War, B.C. 424, the Lacedæmonians, under their general Brasidas, took Amphipolis, thereby leading to the banishment from Athens of Thucydides. Its importance was derived from its situation on a navigable river, a short distance from the sea, and from being in the neighbourhood of the gold mines of Mount Pangæus and the forests of Kerkine, from which, even now, timber is shipped at the mouth of the Strymon. Amphipolis was taken from the Athenians by Philip, king of Macedonia, and it was subsequently made the capital of Macedonia by the Romans. It has long been in ruins, and a small village, called Jeni-Keni, occupies part of its former site, where many medals are still found. The Roman road (called the Via Egnatia) ran through Amphipolis, or perhaps rather through Eion, which was situated at the mouth of the Strymon.

AMPHISBÆNA (*Amphisbæna*, formed from *ἀμφι* and *βαῖνα*, to move in both directions), a term given to a group of serpent-like reptiles capable of crawling with the head or tail foremost. Though they were formerly classed with the Snakes they should be placed among the LIZARDS. In these reptiles the body is nearly of the same thickness from the head to the extremity of the tail, which terminates abruptly and blunt, so that on a superficial glance it is not easy to distinguish between the head and tail, more especially as the eyes are minute and buried, and only to be detected through the horny plate that covers them as little black dots. Hence the natives of South America regard these reptiles as double-headed; and they believe that if the animal be cut in two each distinct portion will continue to live, and that the two heads will mutually seek each other, and the bodies become reunited. The teeth are simple, conical, recurved, and fixed against the internal edge of the jaws. The nostrils are small, lateral, and pierced in a scaly plate. The lower jaw is fixed to the skull, as in birds. The head is blunt, and the muzzle generally resembles a small arched beak; it is covered with plates, similar to those of lizards or serpents. The body, which is snake-like and naked, is surrounded with rings of square scales or plates placed crosswise, and divided into two sets by a slight longitudinal groove on each side. At the lower part of the abdomen there is a row of pores. The tongue is broad, notched at the apex, and covered with papillæ. These reptiles are dull and inanimate, and crawl slowly; they bore into the soft earth, and feed on termites, ants, and insects; they are perfectly harmless. Dumeril and Bibron enumerate ten species, of

which one (*Amphisbæna leucura*) is a native of Guinea; another (*Amphisbæna cinerea*), of Northern Africa, Spain, and Portugal. The rest are all natives of South America and of some of the West India Islands.

The *Amphisbæna fuliginosa* is a native of Brazil, Guiana, and some of the West India Islands. It measures nearly 2 feet in length, and is of a dusky brown colour. It lives upon ants and termites, and often conceals itself in their mounds. These reptiles are far from being attractive, the annulations of the body and their twisting crawling movements giving them a strange appearance. The natives regard their flesh when dried and powdered as a sovereign remedy in cases of dislocation and broken bones.

The white *amphisbæna* (*Amphisbæna alba*) is a native of Brazil, where it is called *Ibiraram*, which signifies "lord of the earth." It is also found in Paraguay. Its body, which in average specimens is about 1 foot 8 inches in length, is of a pure white. It burrows in the ground, feeding chiefly upon ants. (See Plate III. fig. 3 of LIZARDS.)

AMPHITHEATRE (*Amphitheatrum*), was a building used by the Romans for the exhibition of gladiatorial combats, and of fights with wild beasts. The word literally means a double theatre. In the ancient theatre (see plan in the PLATES ROMAN ARCHITECTURE) the spectators sat in a semicircle placed opposite to the straight line of the stage; in the amphitheatre, which was of an elliptic form, the seats were placed all round.

The form of an amphitheatre is thus an ellipse, with a series of arcaded concentric walls, separating corridors which communicate by staircases and radiating passages. It enclosed an open space called the arena, from *arena*, sand; as the floor was always strewn with sand or some such material, to soak up blood, and to keep the feet of the fighters from slipping. The innermost concentric wall bounded the arena, and was from 10 to 15 feet above its level, for safety from the wild beasts. It was made very thick—or even thickened with arches—and thus formed a large platform, on which the chairs and couches of the most distinguished visitors were placed. From this wall an inclined plane ran upwards and outwards over the intermediate walls, staircases, and corridors, to the lofty galleries over the outermost corridors. Thus part of the inclined plane was covered with a graduated series of benches following the general form of the plan. The rows of benches were interrupted at intervals by radial passages leading by a more easy graduation to the corridors. These corridors in the principal stories continued uninterruptedly all round the edifice, and afforded easy access to every part. In cases where the radiating passages through the bank of benches were few, concentric platforms went round to make the communications complete. The external elevation of an amphitheatre was determined by its internal arrangement and construction, and was built in stories of open arches, which were necessary to give light and air to the corridors and staircases. Roman amphitheatres were first constructed of timber, and afterwards of brick or stone.

It was in the later times of the republic that the Romans were first debased by the gladiatorial and other shows which led to the use and construction of amphitheatres. All the wealthy men in the state who were candidates for the highest offices sought the popular favour by these barbarous entertainments; and the sums expended and the numbers of men and beasts engaged (and for the most part destroyed) in these games seem almost incredible.

The amphitheatre of the Romans was raised, for the most part, within the town or city on the level ground, was always of costly magnificence, and generally of enormous extent. Almost every important Roman colony or city bears indications of a constructed or excavated amphitheatre.

theatre. The Colosseum at Rome would contain 80,000 to 100,000 persons; and even the little city of Pompeii contains the remains of an amphitheatre. The Roman garrisons appear to have contented themselves with camp-built amphitheatres alone. Of this sort—the castrensian amphitheatre—we have indications still existing in England; the principal are at Cirencester and Dorchester, but these were originally little more than mere excavations, or turf-built cinctures made up with what walling was absolutely necessary to form the grand concentric bank of benches.

The largest amphitheatre ever built was the Flavian amphitheatre at Rome, commonly called the Colosseum, which was begun by Vespasian and finished by his son Titus, A.D. 80. Its remains cover more than five acres. Its length is about 613 feet, and its width 510 feet. The internal arrangements of this huge structure, after what has been said above, can be easily understood by referring to the Plate Colosseum, in ROMAN ARCHITECTURE.

The external elevation of the Colosseum is composed of three series or stories of engaged columns, with their usual accessories, and an order of pilasters, forming a species of attic, which is pierced with windows—one in every other interspace. The lowest order of columns rests on the ground floor of the structure. It is of Roman Doric; but its entablature wants the distinguishing feature of that style, the triglyph. The intervening arches are semi-circular; they spring from moulded impostes, and have moulded archivolts on their outer faces. The second order is Roman Ionic; and the third is Corinthian. The arches in the intercolumniations in both correspond exactly—except in minor details—with those of the lowest or Doric order. The pilasters of the top order have also foliated capitals. They rest on deep plinths under which there is a continued and recessed dado superimposing the Corinthian entablature. This dado is pierced with holes or small windows alternating with those of the order above, to give light to the corridor behind the lower and under the upper gallery on the inside. The crowning entablature is made bold and effective by deep modillion blocks or consoles occupying the whole depth of the frieze.

Next in size to the Colosseum of existing structures of the kind is the amphitheatre of Verona. Its great external cincture is entirely gone, with the exception of four arches and their accessories; but the great bank of concentric benches, with the staircases leading to them, and the parts about the arena, exist in a comparatively perfect state. Frequent repairs have, however, destroyed the archaeological value of the structure. The outer cincture was pierced with seventy-two arches, and its dimensions were 500 feet by 404 feet; the length of the arena is 242 feet, and the breadth 146 feet.

The amphitheatre of El Jem (Tisdrus) in Tunis is 429 feet in extreme length. The amphitheatre at Nîmes, in France, is large and in comparatively good preservation, as is also that at Arles, about 20 miles distant. The great external cincture of an amphitheatre remains in a very perfect state at Pola in Istria. There are also considerable remains of an amphitheatre at Capua, and of another at Pozzuoli, near Naples. At Præstum there are indications of an amphitheatre, though not a large one; at Catania, in Sicily, the upper and outer encircling corridor of an extensive amphitheatre is accessible, considerably under the level of the modern city, buried by the torrents of lava from Mount Etna. Syracuse and several others of the ancient cities of Sicily exhibit remains or indications of smaller amphitheatres.

AMPHIUMA is a genus of the Pseudosauria (or false lizards), which is an order of AMPHIBIA differing from the Batrachia or frog order in not undergoing any metamorphosis during the whole period of their lives. In this

genus, allied in most essentials to the water newts, the form is elongated and eel-like, the skin is naked and smooth, the limbs—four in number—are minute and furnished in one species with three, in the other with two jointless toes. There are no ribs, and the vertebrae are fish-like. The teeth in the palate are in two rows. An orifice exists on each side of the neck, indicating the situation of the branchiae or gills during the tadpole state. The eyes are minute. These singular reptiles live in ponds, drainages, and sluggish waters, and bury themselves during winter in the mud. They are capable of existing on land, but as their food is to be acquired only in the water, they seldom wander far from that element. The three-toed amphiuma (*Amphiuma tridactylum*) inhabits Louisiana, and is sometimes found in swampy places, under the decayed trunks of fallen trees. It attains to the length of 3 feet.

The two-toed amphiuma (*Amphiuma means*) is about 30 inches in length. It is found in Georgia, Florida, and South Carolina, where it lives in ponds and ditches. It will also live on dry land. These animals are sometimes discovered at the depth of 2 or 3 feet under soft mud, in which they burrow like worms, as was instanced in digging a street in Pensacola, when great numbers hibernating were thrown up during the winter season. They feed on small fish, insects, beetles, and the fresh-water unis. The negroes of Florida call the amphiuma "Congo snake," and believe it to be venomous, but without foundation.

AMPHORA, an earthen vessel used by both Greeks and Romans. It was made of many different sizes, but its usual form was a tall narrow vase, with a small neck, tapering from the shoulders down to a point which was either stuck in the ground or in a rack. The amphora was carried by two handles reaching from the shoulder to the neck, one on each side, whence its name (from *ἄμφω*, on each side, and *φίρον*, I bear). Another common shape is the cylindrical form shown in the accompanying figure.

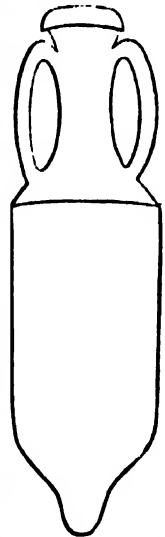
Its chief use was for storing wine, but it was used as well for oil, for honey, and for gold.

There was a typical amphora, which was used as a measure. That of the Romans (by which they measured the tonnage of their ships or the yield of their vineyards) held just a cubic foot. The Greek amphoreus was half as large again as the Roman amphora.

The British museum contains many fine specimens of amphoræ, both conical and cylindrical.

AMPLEXICAUL (Latin, *amplexor*, to embrace, and *caulis*, a stem) is a term in botany used of leaves when they clasp the stem at their bases.

AMPTHILL, a market town of Bedfordshire, 8 miles south of Bedford, and 42 from London by the Midland Railway. It is a clean, well-built, and improving little town. The inhabitants are chiefly dependent on agriculture, but there is a large brewery, and some of the women are employed in straw-plaiting and in the manufacture of straw hats and bonnets, and lace. It has an old parish church, Dissenting chapels, schools, an almshouse, county court-house, and savings bank. Near the town is Ampt Hill House, once the seat of Lord Holland, who in 1826 presented the inhabitants with a handsome public walk, planted with lime trees by Lady Holland in imitation of that at Madrid. It is one of the finest avenues of limes in England. In the grounds a cross marks the site of a



castle where Catherine of Aragon was residing when her divorce from Henry VIII. was pronounced by Cranmer. The population of the parish in 1881 was 2257.

AMPULLARIA. See APPLE-SHILL.

AMPURIAS, a town of Catalonia, in the district of Gerona, is situated on an elevated spot near the Gulf of Rosas. Its ancient name was *Emporeium* (Strabo, 160, ed. Casaub.), and it was a Greek colony of Marseille. The Romans called it *Emporia*. It was then a place of great trade, and had an excellent harbour. In the time of the Goths it was still a place of some consideration, and an Episcopal see. It is now nearly 2 miles from the sea, and has about 4000 inhabitants. There are many ruins of ancient temples and other edifices near the town.

AMPUTATION (Latin, *amputo*, to cut off), the cutting off of a limb from the body. In ancient times such an operation was attended with the greatest difficulty, owing to the fact that the surgeons had no efficient means of stopping the flow of blood from the divided arteries. The modes adopted can hardly be read without a shudder; and an immense advance in the practice of surgery was made in 1674 when the *TOURNIQUET* was introduced by a French surgeon named Morell. Subsequent discoveries, such as the introduction of the needle and ligature, and the use of anæsthetics, enable modern surgeons to perform such operations with great facility and success. There are three methods in use by which operations are performed—the “circular,” the “oval,” and the “flap” in its different modes. The latter is most generally adopted in this country, and has for its object the leaving of suitable portions of muscle and skin to cover the bone. The details of these various methods would be of no interest or value to any save professional readers; but it may be mentioned that in modern practice a skilful surgeon can perform the operation of removing a limb in from thirty to sixty seconds. Of the principal amputations the mortality is about 10 per cent. in the case of the forearm, 28 per cent. in the arm, 32 per cent. in the leg, 35 per cent. in the thigh, and 49 per cent. in the shoulder-joint. These figures give the general results of 9000 cases; but it must be remembered that in individual cases the age, health, conditions, and time of operation materially affect these averages.

AMRITSAR or **UMRITSUR**, a division, district, and city of British India, in the lieutenant-governorship of the Punjab. The division comprises the three districts of Amritsar, Gurdaspur, and Sialkot. Its area is 5335 square miles, and the population in 1881 was 2,800,000.

AMRITSAR DISTRICT, situated between 31° 10' and 32° 13' N. lat., and between 74° 24' and 75° 27' E. lon., is bounded on the N.W. by the river Ravi, on the N.E. by the district of Gurdaspur, on the S.E. by the river Beas, and on the S.W. by the district of Lahore. Its area is 1555 square miles. The district consists of an oblong strip of territory, and is almost a level plain, except for the gradual rise from E. to W.; it is well cultivated, the land being irrigated by means of canals and wells, in addition to the natural streams, of which the chief is the Kirran. Wheat, rice, and other grain are principally grown for home consumption, while sugar and cotton form the chief articles of the export trade; there is both a spring and autumn harvest. A good supply of game, including deer, is found. The centre of the district is traversed by the Sind, Punjab, and Delhi Railway. It has also two good roads, one of which is the grand trunk road. The climate is considered more temperate in the summer than many other places in the Punjab, and in winter is pleasant and healthy. One of the native tribes, the Jats, who number about 75 per cent. of the agricultural community, form admirable soldiers in time of war, and

are equally renowned in time of peace for their skill and industry in tilling the soil. Population, 850,000.

AMRITSAR CITY, capital of the above district, and headquarters of the division, is the religious capital of the Sikhs, and next to Delhi the most wealthy and populous city of the Punjab. It is about 8 miles in circuit, and lies midway between the rivers Beas and Ravi, 32 miles east of Lahore, and is a main station on the Sind, Punjab, and Delhi Railway. The streets are narrow, but the houses are mostly lofty, and built of burnt brick. The Rajah Runjeet Singh built the fort of Govindgarh here in 1809, and improved the town by bringing a canal to it from the Ravi River. The city owes its present name to a tank 155 paces square, which was built by the Gooroo Ram Das, who improved the town to such a degree that for a time it bore the name of Ramdas-pur. Ram Das died in 1581, and in the course of time the name of Amritsar (the “Pool of Immortality”) was transferred from the tank just mentioned to the whole town. The sacred pool is held in the greatest reverence, and is annually resorted to by large numbers of pilgrims. It has a temple in its centre, which is dedicated to Govind Singh, who died in 1708, and was the last Gooroo, or religious leader of the Sikhs. A book, containing the code of laws written by him, is deposited in this temple, in the service of which upwards of 500 priests are retained. The shrine was destroyed in 1761 by Ahmad Shah, and defiled with bullock's blood, but was afterwards rebuilt.

A treaty was concluded between the British government and Gholab Singh at Amritsar, on 16th March, 1846, by which the territory between the rivers Beas and Sutlej was ceded to the former power. This city is a place of great commercial importance, owing to its being the resort of merchants and the residence of some bankers of extensive dealings. It has, in fact, become the great centre of the trans-Himalayan traffic. Trade is carried on with Bokhara, Cabul, and Kashmir on the north, and with Calcutta, Bombay, and other places southward. The chief manufacture consists of shawls, made in imitation of those of Kashmir; also woollen cloth, silk goods, and gold thread embroidery. The imports are grain and other produce, English goods, Kashmir shawls, hardware, &c. The estimated values of imports and exports are respectively £2,000,000 and £1,500,000 per annum. Important cattle and horse fairs are also held at the two great religious festivals in November and April. Amritsar was the first mission station of the Church of England in the Punjab. It is the administrative headquarters of the district. The chief buildings are the public offices, Protestant and Roman Catholic churches, and government collegiate school-house. The railway station is north of the city. The population in 1881 was 140,000.

AMSTERDAM or **AMSTELDAM** (formerly called *Amstelredamme*, “the dam, dyke, or embankment on the Amstel”) is the capital of the province of North Holland and the kingdom of the Netherlands, and stands on the south bank of the Y or IJ (pronounced “eye”), an arm of the Zuider Zee, 32 miles N.E. of the Hague, and 107 N. of Brussels. The city is of the form of a crescent, the curved side of which is towards the land, while the extremities and the other side rest on the Y. On the land side Amsterdam was formerly surrounded by ramparts, which, together with its twenty-six bastions, have been demolished, and formed into an agreeable promenade planted with trees. The city, however, forms the central point in the national system of fortification, and in case of necessity the whole of the environs can be laid under water. It is defended on the land side by several detached forts, and the fort of Ymuiden commands the sea. In time of peace the garrison barely numbers 1000 men.

There are four principal canals encircling the city, from

2 to 3 miles long, running parallel to each other, which, being lined with broad carriage drives and handsome houses, may vie with the finest streets in Europe. The smaller canals which intersect the town in various directions divide it into ninety islands, and are traversed by 300 stone or wooden bridges. The Amstel, which intersects the canal at right angles, flows into the Y, and divides the town into the eastern or old part, and the western or new part. It is crossed by a fine bridge, through the central arches of which large ships can pass.

Fronting the mouth of the river, and extending N.E. and N.W., lie the docks, which are formed by great dykes constructed in the Y, and are entered and secured by sluices. In the north-eastern quarter is the Oostelijk Dok, the National Dockyard, and the island of Kattenburg, in which are the quays and warehouses of the East and West India Company, the arsenal, and the Admiralty buildings. In the neighbourhood of the Westelijk Dok

stands the Haarl-Poort or Haerlem Gate, one of the chief ornaments of the city. The Schreijerstoren, or "Crier's Tower," erected in 1482, marks the spot where the mariners took leave of their friends before setting out on their voyages.

The site of Amsterdam was originally a salt marsh, and in order to make a foundation for houses it is necessary to drive large piles or masts of wood through layers of peat and soft clay, which lie upon a firm subsoil 40 or 50 feet below the surface; so that the whole city, with its houses, canals, and sluices, is supported on a substructure of timber. Under the palace alone there are said to be 13,695 piles. The streets are generally in straight lines along the banks of the canals; among the finest are Prinzen Gracht, Keizer's Gracht, and Heeren Gracht. Those in the central parts of the town were formerly narrow and without foot pavements; but great improvements have been carried out, and the city has to a great extent lost its antiquated



Amsterdam.

appearance, and wears quite a modern aspect, although there are still some picturesque towers left. Within the last few years the town has been considerably extended, and many new streets have been built.

Among the principal public buildings may be mentioned the Palace, formerly the *Stadhuis*—a vast and imposing edifice, erected in 1618, adorned with pictures and marble statues, which was taken possession of by Louis Bonaparte when king of Holland, and has been retained as a palace by the present royal family; the *Beurs*, or Exchange, which stands on five arches over the Amstel; the *Oude Kerk*, or Old Church, which dates back to about 1300, and is remarkable for its painted windows and tombs; the *Nieuwe Kerk*, or New Church, a much finer structure, founded in 1408, and containing, besides a carved pulpit and beautiful ornamental brass work in the choir, several monuments, among others those of Admiral De Ruyter, and Holland's greatest poet, *Vondel*; the *Stadhuis*, for-

merly the Admiralty, a modern structure, with several fine paintings; the Admiralty buildings; the arsenal; and the barracks, a memorial of French occupation.

In addition to the places of worship above named there are numerous others, including an English Episcopalian, a Scotch Presbyterian, and various Roman Catholic churches; also some Jewish synagogues, one of which is only equalled by that at Leghorn. Numerous charitable institutions exist, including various hospitals and a seamen's institute. There are Dutch, German, and French theatres; also a *Paleis voor Volksvlijt*, used for exhibitions and operas, which has a fine garden and pictures. Among the prisons may be mentioned the *Rasp-huis* for male offenders, and the *Spin-huis* for females. These were so called from the occupation of their inmates in former times, namely, rasping or sawing wood and spinning.

The literary and scientific establishments of Amsterdam are very numerous. Among these are the *Athenæum*, the

Institute, and the society called "*Felix Meritis*," from the first words of an inscription on the building in which its meetings are held. In these courses of lectures are regularly delivered on all branches of science, literature, and art, and attached to most are museums, collections of paintings, and antiquities. In one of the museums is one of the finest collections of coins in the world. The Association for the Promotion of the Public Weal was established in 1784, and has branches in all the towns of Holland. Its principal object is the education and improvement of the poor. The museum or picture gallery is a truly national collection. A new university was opened in 1877. There are also botanical and zoological gardens.

The want of spring water was formerly a great drawback on the advantages possessed by Amsterdam. It used to be conveyed from a distance in barges, and sold in the streets; but now a very good supply is obtained from the dunes of Haarlem. Improvements have also been made in its sanitary condition by filling in some of the smaller canals, and flushing others by means of the tide.

In former years the only approach to Amsterdam navigable by large vessels, except through the Zuider Zee, was by the North Holland Ship Canal from HELDEN, which, although a great improvement on the old way of reaching the city—for vessels were sometimes detained in the Zuider Zee three weeks at a time—was still a circuitous and expensive route. It is, however, now avoided by means of the Amsterdam Canal, a most important undertaking, which was opened for navigation by King William III., in November, 1876. It provides direct communication westward with the North Sea through the formerly shallow lakes Y and Wykeer Meer, and across a narrow neck of land, outside of which a harbour has been formed, with an area of 240 acres, bounded by breakwaters of *beton* or artificial stone. There is a dyke pierced by three locks to shut out the Zuider Zee, and so treacherous was the soil that 10,000 piles were needed to form a foundation for them. The canal is 16 feet wider at the bottom than that at Suez; and the locks are wide enough to admit ships of the largest class. The work was executed by English contractors, under the direction of Sir John Hawkshaw, the celebrated English engineer. The cost of the undertaking was about £2,000,000, a portion of which was guaranteed by the Dutch government, and a portion was raised on the lands reclaimed, which are so extensive (12,450 acres), as almost to give another province to the Dutch. The distance to the sea is thus reduced to 16 miles.

The harbour at Amsterdam is spacious, and the water deep. It has been much improved by the construction of the Oostelijk and Westelijk docks, which are capable of containing 1000 large vessels, and are inclosed by immense sluice gates. Steamboat communication is regularly carried on between Hamburg, London, and other places. There is a line of railway between Amsterdam and HELDER by way of Haarlem and Castricum, and another connecting it with Utrecht and Germany.

Amsterdam, which from a fishing village in 1200 rose to a place of great commercial importance, attained its highest prosperity in 1648, in consequence of the closing of the river Scheldt in that year, and the great blow to the trade of Antwerp which resulted. It possessed then nearly the whole of the trade with the Indies. Although not now so prosperous as formerly, it is still one of the great centres of European commerce. It has some manufactures of wool, cotton, linen, and silk; also sugar refineries, soap-eries, distilleries, tanneries; oil, glass, and iron works; and shipbuilding. The chief industry is, however, the cutting and polishing of diamonds, for which the Jews of Amsterdam have long been famous. The imports consist principally of sugar, coffee, spices, tobacco, cotton, tea, dye-stuffs, wine and spirits, wool, grain, hemp, flax, pitch,

metals, cotton and woollen stuffs, hardware, rock-salt, coal, &c. The exports are cheese, butter, seeds, rape and linseed oils, linen, spices, coffee and sugar from Java, tea, tobacco, indigo, cochineal, cotton, and other Eastern and colonial products. Dutch gin, or schiedam, is also largely exported. The trade is chiefly with Java, Great Britain, the Mediterranean, Sweden, Norway, and the Baltic. There is very little coasting trade carried on, but the city is the seat of the administration of the marine, of which the magazines and building yards are very extensive. The mercantile navy of the Netherlands, and more especially of Amsterdam, has of late years been declining.

Amongst the men of note to which Amsterdam has given birth must be mentioned the famous philosopher Spinoza. The population in 1882 amounted to 320,000, including 70,000 Roman Catholics, 30,000 German, and 3500 Portuguese Jews.

AMSTERDAM ISLAND, a small uninhabited island in the Indian Ocean, is situated in 37° 52' S. lat., 77° 36' E. lon. It lies, together with the island of St. Paul, 60 miles distant, about midway between Madagascar and Australia. It is of volcanic origin, and contains springs varying in temperature from 80° to 212° Fahr. There are no trees, but shell-fish and sea-fowl are very abundant. The island is the resort of great numbers of seals, which are hunted for their skins.

AMULET (in barbarous Latin *amul'tum*, probably derived from the Arabic word *hamalet*, a pendant), anything worn as a charm to protect against infection, accident, or witchcraft, or to deliver the wearer from evils already suffered. The belief in the efficacy of amulets has subsisted at some time or amongst almost every people. The ancient Egyptians had amulets, often in the form of necklaces, and they were common among the Greeks and Romans. The slips of parchment on which passages from the Law had been written, termed phylacteries, and worn by the Jews, though not designed as amulets, were frequently regarded by them as being preservatives against evil spirits and different kinds of harm. They were largely used by the early Christians, and though in the fourth century the clergy were prohibited from making and selling them, under penalty of deprivation of their office, their use still continued, for we find it was solemnly condemned in 721. Among Orientals there still prevails a firm faith in their efficacy, and the belief has not altogether died out among the ignorant and uneducated of our own country.

AMUR. See AMOOR.

AMURATEL. See MURAD.

AMYGDALÆE is a division of the order of plants ROSACEÆ. The tube of the calyx is lined with a waxy disc; the single carpel is superior; the fruit is a *drupe*, that is, it is fleshy with a bony lining. The flowers, seeds, and leaves yield hydrocyanic or prussic acid. Owing to the last circumstance the species are all more or less poisonous. On the other hand, those parts in which the prussic acid exists either in very minute quantity or not at all, as the succulent fruit, and sometimes the kernel, are harmless, and are often valuable articles of food. The peach, the nectarine, the plum, the cherry, the almond, the apricot, prune, damson, and bullace are produced by different species of this order.

Besides the substance already mentioned, the bark of Amygdalæe yields a gum which is similar in its properties to gum arabic, and an astringent substance which gives some of the species so much efficacy in fevers that their bark has been compared for utility to Peruvian bark, and even in some cases—as the cocciniglia bark of Calabria, the produce of *Prunus cocciniglia*—has been preferred.

AMYGDALUS is a genus of plants belonging to the division AMYGDALÆE, which includes the almond and peach. It is known from other genera by the stone being

coarsely wrinkled, and the leaves folded in halves in the bud—not rolled round.

Amygdalus communis (the common almond) is a native of Barbary, and was introduced into England about 800 years ago. It is only grown here for the sake of its beautiful vernal flowers, but in the countries that have a long and hot summer it is the fruit for which it is esteemed. This, which is produced in immense quantities, is partly exported into northern countries, and partly pressed for oil or consumed for various domestic purposes.

There are two varieties, sweet and bitter. Of the sweet almonds the parts which are officinal are the seeds or kernels. The commercial varieties are numerous, but the most esteemed are the Jordan almonds. Triturated with water, sweet almonds form a grateful sweetish emulsion,



Almond Branches—Flowers and Fruit.

which possesses considerable nutritious as well as demulcent properties. Almonds, as an article of dessert, are nutritive, but rather indigestible. In some persons they occasion, more particularly bitter almonds, an eruption similar to nettle-rash, and other troublesome symptoms.

Bitter almonds are smaller and flatter than the sweet. These most esteemed come from Provence, the others chiefly from Barbary. They have a very bitter taste and scarcely any smell, but if rubbed between the fingers with a little water they emit a peculiarly agreeable odour. Triturated with water they form an emulsion, which by distillation yields a volatile oil, containing hydrocyanic acid. A fat or fixed oil is also contained in them, which may be procured by expression.

Oil of almonds may be obtained from either variety, but is yielded in greatest abundance by the bitter almond. Almonds which have become rancid yet yield by expression good oil, if a little calcined magnesia be added to the bruised almonds before being subjected to pressure. Almond

oil is often adulterated with poppy oil. It is employed more as an external application, especially to the ears, than internally.

Amygdalus Persica (the peach, once called the Persian apple) has for ages been an object of careful cultivation for the sake of its delicious fruit, and has almost naturalized itself even in the New World. In our gardens many varieties are known, which are classed under the two heads of peaches and nectarines, according as their fruit is smooth or downy.

Peaches require a somewhat rich and light loamy soil, as the application of manure, if not very much decomposed, is apt to induce in them a luxuriant habit of growth, strong ill-ripened shoots, and diseases which hasten their death.

AMYL (C_5H_{11}), from Gr. *amulon*, starch, the radicle of amyllic alcohol, a spirit which in a crude state is met with in the distillation of potatoes. This alcohol (potato fusel oil) was discovered by Schrele. Amyl in the free state was prepared by Frankland in 1849 by heating iodide of amyl with an amalgam of zinc in sealed tubes for some hours. It is found also among the products of coal-tar distillation. It doubles its molecular constitution on isolation; Frankland's product is therefore termed diamyl, and its formula written $(C_5H_{11})_2$ or $C_{10}H_{22}$. Diamyl or amyl has the specific gravity 0.77. It is a colourless liquid, of an agreeable smell and burning taste. It boils at $155^\circ C$; its vapour density is 4.9. It takes fire when heated, and burns with a smoky flame. Amyl is of service in chemistry on account of the large number of substitution products derived from it.

Amyl alcohol, the hydrate of amyl or fusel oil ($C_5H_{11}O$), is found with all alcohol when produced by fermentation; hence careful rectification is essential. The peaty smell of whisky is due to its presence. It is found in largest quantities in those liquids which remain most alkaline during fermentation. Intoxication with spirit containing it causes temporary madness, and in the opinion of many physiologists much of the diabolical crime committed by drunken persons is due to their having imbibed it. It is purified by washing in water and redistilling. The following are some of its compounds:—

Bromide of amyl, a volatile liquid without colour, and of greater specific gravity than water.

Amylic ether or oxide of amyl ($C_{10}H_{20}O$), a colourless liquid with an agreeable odour, is prepared by the action of sulphuric acid on amyl alcohol.

Amyl forms compounds with bromine, chlorine, and sulphur. The nitrite of amyl is an inflammable liquid lighter than water, having the odour of fully ripe pears. When the vapour of one or two drops is inhaled by man it produces a violent acceleration of the pulse, and has been used with good effect in angina pectoris and spasmodic diseases.

AM'YLENE (C_6H_{10}), a transparent, thin, colourless liquid, having the odour of rotten cabbage. It is produced by the dehydration of amyllic alcohol by sulphuric acid, phosphoric anhydride, or chloride of zinc, and was discovered by Ballard in 1844. It has been used as an anæsthetic, as a substitute for chloroform, but has in several cases led to fatal results.

AM'YLOIDS is a term used in animal physiology for certain components of food stuffs. These are starch, dextrine, sugar, and gum. They contain carbon, hydrogen, and oxygen: the last two are in the proportion to form water (H_2O); and thus amyloids contain less carbon and hydrogen in proportion to oxygen than the fats. There is no nitrogen in either amyloids or fats, and therefore starvation will ensue unless a proper supply is afforded of proteids, such as flesh, eggs, cheese, &c. See ANIMAL CHEMISTRY.

AM'YOT, JACQUES, grand almoner of France and bishop of Auxerre, rose to these high dignities from the

humblest rank. He was born at Melun in 1518. When he came to Paris to continue his studies, he was obliged to act as servant to some of his fellow-students in order to procure the means of subsistence. After studying in the College of France, which had then been recently founded, and taking his degree of master of arts, at the age of nineteen he went to Bourges to study law, where he distinguished himself so much as to induce the king's lecturer, Jacques Colin, to intrust him with the education of his nephews. Through the patronage of Marguerite de Valois, sister of Francis I., Amyot obtained a Greek and Latin chair at the University of Bourges. It was here that he began his translation of Plutarch's Lives, of which he dedicated the first books to the king, Francis I. The king, as a mark of his approbation, gave him the abbey of Bellocane. Under the pretence of going to Italy to consult some manuscripts, he was intrusted with a letter from Henry II. to the Council of Trent, in 1551. He displayed much firmness and skill in his mission, and the Cardinal of Tournon recommended him to Henry II. as tutor of his three younger sons. Charles IX., on his coming to the throne of France, made Amyot his great almoner and keeper of the University of Paris; he also gave him the see of Auxerre. Henry III., on his accession to the throne, continued him in his dignities. Amyot died very rich, in his diocese, in 1593.

Amyot's translation of Plutarch's Lives has great merit, both for fidelity and expression. North professed to make his (English) version from it. Amyot also translated the Greek romance of Heliodorus, seven books of Diodorus Siculus, the Greek pastoral romance of Longus, and the "Moral Treatises" of Plutarch. His translations greatly contributed to fix the French language.

ANA, a Latin termination of the neuter plural form. Ciceroniana, for instance, would signify matters or things of any sort about or pertaining to Cicero. In modern times the term is also frequently used as a noun, and means anecdotes. The sayings of eminent men have been collected from very early periods, both by the Eastern nations and the Greeks and Romans; but the term "ana" dates only from the fifteenth century. In our own literature many works may be found of this class, and some of them are of considerable value. Among these may be mentioned the *Walpoliana*—containing sayings and anecdotes of Horace Walpole, earl of Oxford; Selden's "Table Talk;" and the inimitable "Life of Samuel Johnson, LL.D.," by Boswell, which owes the perennial interest it excites to the carefully recorded anecdotes and sayings of its subject.

ANABAPTISTS, a religious sect. The word, composed of two Greek terms, properly signifies those who insist upon the necessity of a second baptism in persons whom they admit to their communion. It is sometimes applied to designate that large body of Protestant Christians, one of whose articles of belief is that baptism ought only to be administered to adults, and who, accordingly, rebaptize those who seek to join them. But this application of the name is quite unwarranted, and one against which the community in question have always protested. Baptists is the designation assumed by those who thus hold the doctrines of the non-validity of infant baptism, and the necessity of adult baptism. See **BAPTISTS**.

The Anabaptists were, no doubt, the growth of the Reformation—though Protestant writers have laboured hard to make it appear that such was not the case. They were the ultra-radicals of the Reformation. Munzer, Stubner, and Storck, who were the first heads and apostles of the sect, had all been disciples of Luther, although no person could have more earnestly condemned their proceedings than did that great reformer. They first began to preach their peculiar doctrines in the town of Wittenberg, in Saxony, in the year 1521. In 1525 their followers,

composed almost exclusively of the lowest rabble, rose in a general rebellion against the established authorities throughout that province, Suabia, Thuringia, and Franconia. But this insurrection, which it is only fair to remark was partly of a political character, was soon defeated; and Munzer himself, being taken, was put to death. The novel notions, however, which he had preached spread as usual under persecution, and some years afterwards the mischief broke out again with new fury. In 1532 a numerous mob of these fanatics, conducted by John Matthias, a baker of Haerlem, and John Boccoldt, a tailor of Leyden, suddenly attacked the city of Munster during the night, and made themselves masters of the place. Their adherents immediately flocked thither from all quarters, and elated by their success the congregated enthusiasts are stated to have given themselves up to extravagances far exceeding anything they had before practised. Matthias named Munster Mount Zion, and proclaimed himself its king. Having, however, attended with only thirty followers, madly undertaken to attack and disperse the forces which came to recover the town, he perished, with all who accompanied him. John of Leyden now assumed the royal dignity, and under his conduct the multitude is said to have proceeded to wilder excesses than ever. The city, however, was at length recaptured by the army which the bishop had brought up against it, on the 24th of June, 1535; and Boccoldt, having fallen into the hands of the victors, was soon after executed with the most terrific cruelties that hatred and revenge could dictate.

The most extravagant tenets, as well as conduct, have been commonly ascribed to the Anabaptists of Munster; but the accounts of a described sect by their enemies are scarcely to be received with implicit credit, and it is unnecessary to recapitulate all the charges that have been made against them. Several sects have been since unjustly confounded with them; but for further information on the subject of the Munster Anabaptists, the reader may be directed to Mosheim's "Ecclesiastical History" (sect. iii., pt. ii., chap. iii.), where he will find the subject treated with great learning, though not in a spirit of much liberality or candour. The principal works relating to the Anabaptists are all referred to in that dissertation.

Several Anabaptists were executed in England from 1535 to 1540. On 6th January, 1661, about eighty appeared in arms in London, under the leadership of Thomas Venner, a wine cooper. They fought desperately, and killed several of the soldiers sent against them. Their leader and sixteen others were subsequently executed.

ANABAS (from *ana*, *basin*, to ascend), the name given by Cuvier to a genus of acanthopterygians fishes



Head of *Anabas scindens*, laid open to show the peculiar pharyngeal apparatus.

remarkable for the power of living for a considerable time out of the water, of travelling over the land for a great distance, and even of ascending trees, by aid of the fins.

the tail, and the spines of the gill covers. The gills are constructed for retaining water, the pharyngeal apparatus being labyrinthiform, that is, divided into a number of irregular lamellæ, more or less numerous, forming cavities and little cells capable of retaining a certain quantity of water, which evaporates slowly. Of this genus only one species is known, *Anabas scandens* (the climbing perch). It is a native of India and the Indian Archipelago, living in marshes. Its native name at Tranquebar is *paunci-cri*, which signifies "tree-climber;" and Daldorf stated that he had observed it in the act of ascending palm trees near the marshes, and had taken it at the height of five feet above the surface of the water. This species is covered with large scales. The borders of the gill-covers are strongly denticulated, and the dorsal and anal fins have numerous spiny rays. The tail is somewhat rounded; the head broad; the muzzle obtuse; the mouth small; length, 6 inches; the fins of a violet colour.

Mr. F. Day, in the Journal of the Linnean Society, states that under the influence of fear the climbing perch erects the spiny-rayed fins, and even its scales down to those at the base of the caudal fin.

ANABASIS (literally, "the going up," i.e. from the sea-coast inland), the title of a Greek work, in seven books, by Xenophon of Athens, which describes the circumstances of an expedition undertaken by the younger Cyrus, B.C. 401, against his brother Artaxerxes, king of Persia. (The term is also used as the title of the history of Alexander's campaigns by Arrian.) The expedition of Cyrus is the first long march of which we possess a detailed account, and also the oldest extant document which gave to Europeans any precise notion of the countries watered by the Upper Tigris and Euphrates.

The army of Cyrus contained a large body of Greek mercenaries, among whom was Xenophon, not, however, serving as a soldier. Cyrus set out from Sardis (now Sart) 38° 34' N. lat., 28° E. lon., and marched through Asia Minor to the passes in Mount Taurus that lead into Cilicia. He next passed through Tarsus, along the Gulf of Scanderoon, and through the north of Syria to the Euphrates, which he crossed at Thapsacus, about 35° 14' N. lat. He then marched S.E. through Mesopotamia, crossing the Araxes (the Khâbour), and finally lost his life in an engagement with his brother on the plains of Cunaxa (the site of which is unknown), about 40 miles from Babylon. Almost at once the whole of the Greek generals were treacherously massacred by the Persian Tissaphernes. In this emergency Xenophon came forward and bore the chief burden of the command.

From Cunaxa commenced the retreat, commonly known as the Retreat of the Ten Thousand. The Greeks, after many difficulties, reached Trapezus, now Trebisond, on the Black Sea, whence they marched along the coast westwards for about 100 miles (direct distance) to Cotyora.

The following are the distances given by Xenophon in round numbers:—

	Stadla.
From Ephesus to Cunaxa,	16,050
From Cunaxa to Cotyora (eight months),	18,600
	34,650

Xenophon adds the march of the Greek auxiliaries from Ephesus to Sardis (about 50 miles) to the distance from Sardis to Cunaxa.

The march may be considered as having terminated at Cotyora, as the army sailed from this place to Sinope; their troubles, however, continued till they reached Byzantium. Many took service under Sathes, king of Thrace; and some afterwards returned for a second campaign with Xenophon against their old enemy Tissaphernes.

He at once the stadla of Xenophon at the rate of ten to

a mile—an estimate which is above the truth—the whole distance marched is 3465 English miles, which was accomplished in fifteen months, and a large part of it through an unknown mountainous and hostile country.

ANABLEPS (from *ἀναβλέπω*, to look up), a genus of fishes belonging to the *Physostomi*, remarkable for the curious structure of their eyes, which, in consequence of the division of the iris and cornea by transverse ligaments, have two pupils, and appear as if double, whilst there is only one crystalline humour, one vitreous humour, and one retina. There is no other example known of such a modification of structure among the Vertebrata. This peculiarity of the Anableps has given rise to several stories of four-eyed fish, with exaggerated accounts of their habits. It is a fact that they can see as well out of water as in it, and are often seen to swim with half the head out. The *Anableps tetraphthalmus* inhabits the rivers of Guiana and Surinam. Its body is cylindrical, and covered with strong scales; its head is flattened, and snout blunt. The upper jaw projects beyond the lower.

ANACANTHINI is an order of fishes belonging to the subclass *TELEOSTEI*. This order is divided by Günther into five families. The first, *Lycoideæ*, are small fishes somewhat like blennies; they inhabit the ocean along the shores in Arctic and Antarctic regions, but one genus is confined to the coasts of Panama, and another is found only off the north-east coast of Australia. In all these fishes the gill-opening is narrow; and the vertical fins (those in the median line along the back and under side) are continuous, so as to form long single fins, running into the tail fin.

The second family, *Gadidæ*, include the cod, haddock, and whiting, belonging to the genus *Gadus*; the hake, pycis, burbot, ling, and rock-ling. The gill-opening is wide in this family. There are one, two, or three dorsal fins, occupying nearly the whole of the back. The tail fin is distinct in some fishes from the dorsal and anal fins; in others it is united, but then the dorsal has a separate portion in front. The greater number of the "cod-fish" family live at the surface near the shore, and these are confined to the temperate zones and warmer parts of the frigid zones. The deep-sea forms, as usual, have a much wider range.

The third family, *Ophidiidæ*, is composed of fishes which are all marine, except one genus, *Lucifuga*, a blind fish which inhabits the dark subterranean caves of Cuba. Many of these fish live at depths of 1000 to 2500 fathoms, and generally have the eye in a rudimentary condition, and entirely covered with the skin. Two genera, *Fierasfer* and *Encheliophis*, are small and eel-like, and are remarkable as living in the respiratory cavities of star-fishes and other marine animals, and feeding on the animalcules which enter with the water. The sand-eel and lancee (see Plate, fig. 1) are known on British coasts. In *Ophidium* (fig. 2) the ventral fins are replaced by barbels.

The *Macruridæ* are deep-sea forms with a long compressed tapering tail, and their body is covered with scales which are spiny, keeled, or striated.

The *Pleuronectidæ*, or "flat fishes," constitute the fifth family. These differ from the other families in having the head and part of the body formed unsymmetrically. The "flat fishes" are extremely useful as food from their fine flavour, large size, and great abundance. Amongst them are the plaice (fig. 3), the whiff (fig. 4), the sole (fig. 5), halibut, turbot, and dab.

The *Anacanthini* are characterized by Günther as *Teleostei* that have the vertical and ventral fins without spinous rays; the ventral fins, if present, are either beneath or in front of the pectoral fins, never abdominal; and the duct which in so many fishes connects the air-bladder with the intestinal tract, is represented in the adult form by a fine ligament.

ANACARDIA'CEÆ, or the cashew tribe, is an order of dicotyledonous plants, consisting exclusively of woody plants, abounding in an acrid resin. Their juice is often used as a kind of varnish, for which it is well adapted, in consequence of its turning hard and black when dry. It is, however, often dangerous to use, because of the extreme acridity of the fumes, which are apt to produce severe inflammation in many constitutions. The flowers are symmetrical; the stamens definite, and springing from below the ovary; there is only one ovule in the ovary, attached to the bottom of the cell by a cord. In the rare cases where more than one ovary exists, these are separate one from the other. The seed has little or no albumen.

Among important plants belonging to this order are the **CASHIEW NUT**, **PISTACIA**, **MANGO**, **MELANORRHIZA**, **SPONDIAS**, **RHUS**, **SCHINUS**, **MARKING NUT**. The cashew nut is the produce of *Anacardium occidentale*.

ANACHARIS is a genus of water plants belonging to the order **HYDROCHARIDACEÆ** (the frog-bits). A North American species, *Anacharis Alaiustrum*, was first noticed in this country in 1842, by Dr. Johnston of Berwick, in the lake of Dunse Castle. Since that time it has spread in the Trent, Derwent, and other rivers and canals, to such a marvellous extent as to become an impediment to navigation, water-mills, and even the passage of salmon trout. There is evidence that it is dying out in some of these localities, having probably exhausted the soil of its own special nutriment. It is very readily propagated, the smallest portion taking root. The stem is long and branched; the small pellucid leaves are generally in whorls of three; the flowers bud beneath the surface of the water, springing without any flower-stalk from the axils of the upper leaves; the tube of the perianth grows 2 or 3 inches long until it reaches the surface, and then opens out into three or six small segments.

ANACHARSIS, the Scythian, was, according to Herodotus, the son of Gnuarus, and the brother of Saulius, king of the Scythians. His great desire of knowledge, joined to natural good sense, led him to lay aside the prejudices of his countrymen against intercourse with foreigners; he accordingly visited Athens, where he arrived in the time of Solon, with whom he is said to have formed an intimate friendship. The novelty of his appearance, his anxiety to learn, and the shrewdness of his remarks, made a great sensation among the Athenians. He is said to have compared the legislation of Solon to a spider's web, in which the weak might be caught, by which the strong would break through. The fact that at Athens political matters were discussed by the Prytanes before they were brought before the assembly of the people for approbation, led Anacharsis to say that at Athens wise men deliberated, but left the decision to fools. It is probable that to these and similar sayings Anacharsis owed his reputation as a sage and a philosopher. He is said to have been presented with the freedom of Athens, and to have been initiated in the Eleusinian mysteries; but Lucian justly doubts the correctness of the statement. His fondness for religious mysteries, however, is said to have been the cause of his death. On his way to his own country, when he reached Cyzicus, the inhabitants were performing the mysteries of Cybele, the mother of the gods. Anacharsis made a vow to the goddess that if he returned home in safety he would solemnize these mysteries in the same manner. He performed his vow in a wooded district called Hylæa, but was discovered by a Scythian, and denounced to the king, his brother. The king came to the spot to convince himself; and seeing Anacharsis perform the Greek rites, shot him dead with an arrow. Aldus, in his collection of the Greek "Epistolographers" (Venice, 1499, 4to), published nine letters under the name of Anacharsis, which are pronounced by Bentley to be forgeries.

ANACHRONISM, a word of Greek derivation (*ana* and *chronos*), used to denote an error in chronology, often a grave and inexcusable fault, but sometimes purposely made in poetry and the drama for the sake of effect, or to bring certain events within convenient compass for dramatic purposes. Thus the writers of the middle ages made Alexander, Æneas, and other ancient heroes talk and act as if they had lived 1200 years after the Christian era. Shakspeare, too, in "Julius Cæsar," makes the "clock" strike three; and Schiller, in "Piccolomini," speaks of a lightning conductor as existing nearly 200 years before it was invented. Anachronisms are frequently to be noticed in old paintings, where we find the ancient patriarchs, prophets, apostles, or heroes exhibited with the dress and surroundings of the period and country in which the painter lived.

ANACON'DA (*Eunectes murinus*) is the largest of the snakes belonging to the boa family, or Boidæ. This family is destitute of poison-fangs, crushing their victims in the powerful folds of their bodies. The anaconda differs from the boa constrictor in having its head furnished with irregular plates.

The mouth of the anaconda is dilatable and the jaws are movable, so that it swallows its prey whole. It lives for the most part in the water, often lying on the bank of a river on the watch for its prey, which consists of birds, small mammals, and even fish. It is of a brownish colour, with round black spots down the back. The anaconda possesses rudimentary hind limbs and a prehensile tail, and by means of these it can suspend itself readily from trees. It brings forth its young alive. The length attained by these snakes differs considerably, but some have been seen which have reached 20 feet. It is a native of South America, being particularly abundant in the forests of the Amazon.

ANACREON, one of the most famous lyric poets of Greece. He was born at Teos, a city of Ionia, in Asia Minor, probably about 560 B.C. Anacreon was held in high esteem by Polycrates, tyrant of Samos, and Hipparchus, son of Pisistratus, tyrant of Athens, two of the most eminent men of their age. He resided with Polycrates probably till the death of the latter, B.C. 522. He also visited Athens, which he left after the death of Hipparchus, B.C. 514. His old age seems to have been spent at Abdera in Thrace, whither the Teians had emigrated and founded a new city, when Teos was attacked by the Persian troops of Cyrus, commanded by Harpagus, B.C. 540. According to tradition he died in the year 475 B.C., at the age of eighty-five, while on a voyage from Abdera to his native island, having been choked by a dried grape or grape stone. Of his personal character we know little; his genuine poetry shows that he was a lover of pleasure, but it presents him in a better light than the spurious odes which pass under his name. All the poems of Anacreon were composed in the Ionic dialect. The odes attributed to him are all amatory and convivial. They have been much admired, and often translated and imitated. Cowley and Moore have translated some of them. Some pretty specimens of the poet (including one or two of Cowley's translations) are given in Merivale's "Anthology."

Anacreon was first edited by H. Stephens, who got possession of two manuscripts, and published them, after careful collation, in 4to, in 1554. But many of the odes which pass as those of Anacreon are undoubtedly the spurious compositions of a later age. The genuine fragments have a character altogether different from these insipid verses, which are, moreover, often barbarous in expression. The fifty-five odes attributed to Anacreon are in Fischer's edition (Leipzig, 1793, 8vo), which contains also the fragments which are supposed to be genuine. The best separate edition of the fragments is by Bergk (1834, 8vo).

ANADYR is a river in Siberia, principally remarkable

for being the only considerable river of the globe whose sources lie within the polar circle, between 68° and 69° N. lat. It rises in Lake Ivachno, in the Aldan Mountains, and falls into the Bay of Anadyr, a large gulf of the Sea of Kamtchatka, forming an estuary at its mouth. Its whole course is upwards of 500 miles, of which 300 are navigable. The only station on its banks is Anadyrsk.

ANÆMIA, a condition of the body brought about by poorness of blood. It is a very general complaint, affecting both sexes, but is more common with women than men, and more frequently affects young persons than old. It may arise from various causes, such as loss of blood, an excessive discharge of the menses, piles, diarrhoea, over-lactation, indulgence in alcohol, or excessive smoking. Overwork and anxiety, and long and close confinement indoors, the want of light, or long-continued pain are also common causes of this disease. The symptoms are pallor of the face and skin, the inner lining of the eyelids or the lips being often of a pale pink colour, a general feeling of lassitude and weakness, want of appetite, disturbed rest, headache, noise in the ears, the appearance of specks before the eyes, and a quick but weak pulse. There is often also a disturbed state of the stomach and bowels, and considerable mental despondency. The treatment consists, in the first instance, of the removal, as far as is possible, of the exciting cause of the complaint. Where it is brought about by loss of blood the discharge must be stopped or restrained by suitable means. In the case of over-lactation it is needful to wean the child. In other cases exercise in the fresh air, great moderation in the use of alcohol or tobacco, change of scene and occupation where possible, the use of the cold bath every morning, and attention to diet, rest, and ventilation are all necessary to bring about a better state of health. Of medicines the most useful are the various preparations of iron, which will generally be found of very great service. Where iron cannot be taken other tonic medicines may be tried; but though some are very useful there are none so effective as iron. In the majority of cases the use of the means indicated will serve to remove the disease, and it will be found as the general health improves the symptoms will gradually disappear of themselves.

ANÆSTHESIA, a term used in medicine, implying partial or total loss of sensibility or feeling. Sensation in the human body depends upon the integrity of action between the nerves and the brain. Thus in a state of health sensations of pain or of touch are swiftly conveyed from any part of the body to the brain, and there awaken a consciousness of the impression, though in every case the mind associates the sensation with the part affected. But if by any means this integrity of action is impaired, there is a corresponding change in the sensations experienced. Thus in certain diseases, owing to nervous excitement, feeling may be intensified, and sensations that at ordinary periods would be almost unnoticed awaken feelings of intense irritation or suffering; and, on the other hand, in a state of catalepsy or trance, though life remains, there is often a complete insensibility to all feeling. The same state may also be confined to a limited portion of the body, and in certain diseases one of the most characteristic signs is the insensibility of the part affected; while in every case the division of a nerve—the cutting it off from its connection with the brain—is followed by a complete want of feeling or sense of touch in the part it supplies. It was discovered at a very early period in human history that certain drugs had an influence over the brain, and produced insensibility or indifference to pain; and references to the use of such drugs are to be found in Homer and Herodotus, while the employment of a soporific drug in surgery is expressly referred to by both Dioscorides and Pliny. The Chinese, as far back as the third century of our era at least, used a preparation of Indian hemp for this

purpose; and mandragora, also, was frequently employed in Europe until a comparatively late period. In the year 1800 Sir Humphrey Davy made some interesting experiments on nitrous oxide gas, and in his published account of them suggested that as the gas, when inhaled, seemed capable of destroying pain, it might probably be used to advantage in the practice of surgery. No practical notice of this was, however, taken for many years, but in 1818 Faraday discovered that a similar effect was produced by the inhalation of sulphuric ether; and the same fact was noted and published in America by the physicians Godman (in 1822) and Mitchell (in 1832). The first practical application of it was made by Dr. Wells of Hartford, Connecticut, in 1844. It was afterwards used by Dr. Morton of Boston, in 1846; and when in the same year the news of his success reached England the practice was adopted by Liston, an eminent Edinburgh surgeon, who first used it on 21st December, 1846, in a case of amputation. The use of ether spread rapidly both in Europe and America, and on 19th January, 1847, Sir James Y. Simpson applied it successfully to midwifery practice. In the early part of 1847, Sir William Lawrence and Mr. Holmes Coote, on the recommendation of M. C. Funnell, a medical student, used chloroform in St. Bartholomew's Hospital, London, but they did not then publish the results. In the same year Mr. Waldie, a Liverpool druggist, suggested the use of the substance to Sir James Simpson, who, having fully investigated its action, introduced it in his own practice and to the profession generally. In England, the British colonies, and on the continent of Europe it soon superseded the use of ether. In the United States, however, ether is still preferred by the medical profession, and is declared by them to be a safer anæsthetic than chloroform. Many experiments have since been made to discover substances to serve the same end; and bichloride of methylene (CH_2Cl_2), chloroform (CHCl_3), dichloride of ethylene ($\text{C}_2\text{H}_4\text{Cl}_2$), ethylic bromide ($\text{C}_2\text{H}_5\text{Br}$), amylene (C_5H_{10}), ether ($\text{C}_2\text{H}_5\text{O}$), and various others have been recommended and their effects compared. The whole subject has recently been reinvestigated by a committee of the British Medical Association, with the result of showing more precisely the physiological action of these and other anæsthetics. The committee find that chloroform weakens the action of the heart and lowers the pressure of the blood to a greater extent than either ether or ethylene. Ether has the least injurious effect of this kind of all anæsthetics, whilst ethylene comes midway between ether and chloroform. Ethylene has the advantage over chloroform of being less injurious to the heart and to the nervous centres of respiration, and it has the further advantage over ether of being more pleasant to take, less likely to irritate the air passages, and of being non-inflammable. Its chief disadvantage at present is its great cost. The committee is strongly of opinion that as regards safety, ether is in the first rank, ethylene second, and chloroform third, thus so far bearing out the opinion held in America as to ether. At the same time, all anæsthetics are in a sense dangerous, and each has its special danger. Thus chloroform is likely to weaken the heart, ether to act injuriously on the nervous arrangements of breathing, whilst ethylene acts on both, but to a less extent than either of the other two. Much depends on careful administration and on selecting cases suitable for each anæsthetic. Chloroform is safe in childhood, but risky in old age, or where there is a weak heart; ether or ethylene are more suitable for advanced life, and in cases of weakened heart. Few deaths occur from anæsthetics, when we take into account the enormous number of cases in which they are used; whilst their introduction into surgery has made possible many delicate and painful operations, and has saved humanity from incalculable suffering.

Nitrous oxide gas, which produces anæsthesia by temporary suffocation, is used with considerable safety by dentists, and is suitable likewise for all operations requiring only a few seconds for their performance. Local anæsthesia by freezing or cooling the parts by the evaporation of a spray of ether, introduced by Dr. B. W. Richardson, is sometimes employed by surgeons, but not to the extent at one time expected. (For details as to anæsthetics, see "Lyman's Artificial Anæsthesia," London, 1882, and Reports in *British Medical Journal*, 1879-81.)

ANAGNI, the ancient *Anagnia*, capital of the Hernici, and a place of importance under the Romans (Cicero's fine estate there being well known), is now a badly built town of about 6000 inhabitants, 46 miles E. by S. of Rome, in the province of Roma, and on the railway to Naples. It is a bishop's see, and has a cathedral dating from the eleventh century. It stands on a hill above the valley of the Sacco, in the middle of a fertile agricultural district, and has some hot springs. Several popes were natives of the town.

ANAGRAM signifies a new word formed out of the letters of any given word by the process of writing them over again—as the term literally signifies—or placing them in a new order. Sometimes the anagram is formed out of two or more words, and it may be itself always either one word or several. Many authors, instead of putting their names on the title-pages of their works, have, with an affectation of modesty, used the anagrams of their names. At one time, also, the anagram was much made use of by mathematicians in announcing discoveries, the credit or property of which they wished to secure to themselves without revealing the secret in which they consisted.

ANALEPTICS, a term formerly used in medicine to designate those drugs, such as bark, quassia, or iron, which were administered as tonics to strengthen the system. It is now almost obsolete.

ANALOGY proper is the similarity of ratios or relations. A ratio or relation means that two objects (which are called the *terms of the ratio*) are considered together in reference either to some quality which they have in common, or to some manner in which one has affected the other. Thus two things may stand in a certain relation to each other in respect of quantity, shape, colour, or other qualities; in which cases the subject of comparison is common to both, and belongs to them in a greater or less degree. Thus, when we say that one thing is larger, more probable than another, we mean that each of these pairs of things having in common the quality referred to, the one has it in a greater degree than the other. These, which might be called *ratios of degree*, differ altogether from the other class, which includes all those relations arising from the manner in which one term of the ratio has affected the other, or is necessarily connected with it, and not from any attribute which they possess in common. Thus, we may speak of the relation of God and man, of the relations of men as members of the same political society or of different political societies, of the relation of a bird to its egg; in which instances some act done by one to the other party, or by both reciprocally, or some influence which one term has exercised over the other, is signified, and not any quality or attribute common to both. In some cases of the latter kind there are words which express each term of the ratio *in respect of the relation*; and therefore they mutually imply each other. Such are, for example, parent and child. As in these cases it is impossible to conceive the one term without conceiving the other, these other terms might be called *ratios of implication*, as distinguished from those ratios in which a comparison is made of qualities existing independently in the things compared. For example, there cannot be a husband without a wife, nor is there any quality which a husband

has, as husband, independent of the wife; but although there cannot be a short man or a tall man without a man of middle size, yet the height of the short or tall man is an absolute quantity, and independent of the comparison. See **ABSOLUTE**.

When two ratios are compared—that is, when it is affirmed that the relation of two things is like the relation of two other things—the two ratios together form an *analogy*, and each pair of the corresponding terms of the two ratios is *analogous*. Thus, the bark stands in a similar relation to a tree as the skin to an animal; and consequently the one bears an analogy to the other. Of this nature are all fables and parables, in which the circumstances of the person to whom the lesson is addressed are illustrated, by supposing a relation similar to that in which he is placed. It appears then, 1, that in an analogy there must be two ratios, and consequently four terms or objects of comparison; and 2, that there is no connection between resemblance and analogy, and that things may be analogous without being similar, and similar without being analogous. 1. With regard to the first of these propositions it should, however, be observed that, although there must be four terms, it is not necessary that all the four should be different. If there was such a necessity, one of the chief uses of analogy, as an medium of argument and discovery of truth, would be destroyed. All that is required is that there should be two distinct ratios; of what terms those ratios may consist is indifferent. Thus, in the case of brethren, the parents are in an analogous situation in respect of each brother; so the grandfather is to the son as the son is to the grandson. In such cases as these both the relations are known; frequently, however, the relation in which one thing stands to another being known enables us to discover, with greater or less certainty, the relation which the same thing bears to something else which is unknown. 2. Resemblance being the similarity of some sensible quality, as form, colour, taste, smell, or sound, it has evidently no connection with analogy; and if things analogous happen to resemble one another, their resemblance is a mere accident, independent of their analogy.

John Stuart Mill shows the great value of analogical reasoning, and compares *analogy proper* with *analogy in general*. *Analogy in general* is any sort of resemblance (provided that it does not amount to a complete induction), not confining ourselves to that of relations. He gives the following as an illustration of *analogy proper*:—In a joint-stock company it is found that affairs are best administered by a committee chosen by the persons interested, and therefore, arguing from analogy, it is thought that the affairs of a nation will be best managed by a parliament elected by the people. The *fundamentum relationis*, in this example, is the management by a few persons of affairs in which a much greater number are interested along with them. The argument in *analogy proper* is only valid when the consequences to be looked for actually follow from the *fundamentum*. Reasoning from *analogy in general*, if done with care, is quite legitimate, and has great force. To illustrate this mode, consider the arguments that the moon is inhabited. The moon resembles the earth in certain particulars, namely, in being solid, opaque, nearly spherical, having volcanoes, receiving light and heat from the sun, rotating on its axis, and in being composed of materials which gravitate. If this were all that is known about the moon, it might be deemed probable that it has inhabitants. But in estimating the value of this (or any other) analogical argument, account must also be taken of those particulars in which it differs from the earth, namely, in having no atmosphere, no clouds, and therefore no water. Now these circumstances, or some of them, are indispensable to the presence of inhabitants, at least of living things such as we know; and therefore the particulars in which the moon

does not resemble the earth by far outweigh, in regard to their value as evidences, those in which it bears a resemblance. Thus the argument has in this instance broken down. The general argument is this—we see that two phenomena resemble each other in one or more particulars, that one of the phenomena possesses a property not connected with any of the properties in which it resembles the other, and, so far as we know, not unconnected; we infer from the amount of resemblance that the other phenomenon resembles the former in also possessing this property. In the words of Mill, "Where the resemblance is very great, the ascertained difference very small, and our knowledge of the subject-matter very extensive, the argument from analogy may approach in strength very near to a valid induction. If after much observation of B we find that it agrees with A in nine out of ten of its known properties, we may conclude, with a probability of nine to one, that it will possess any given derivative property of A."

Analogy, in zoology and botany, is a similarity of function in parts which are by structure dissimilar. Analogy in this sense is contrasted with *homology* when parts are similar in structure. The wing of a bird is *analogous* to the wing of an insect, and *homologous* to the arm of a man.

ANALYSIS, a Greek word signifying literally the act of unloosing or untying; its opposite is *synthesis*, which is the act of putting together. The modern meaning of the term analysis is the process by which facts, results, or reasonings are separated into their simple and component parts, or by means of which a simple truth is obtained, when given in a more complicated form; so that, in its most general sense, the greatest part of human knowledge consists in the results of analysis. It is, however, for the most part applied in a more particular manner to the methods employed in those branches of inquiry which most strikingly exhibit direct analysis, viz. mathematics and natural philosophy, particularly chemistry.

I. ANALYSIS IN MATHEMATICS.—By a very incorrect application of the term, algebra, the differential calculus, &c., have been called by the general name of *analysis*, in opposition, not to *synthesis*, but to *geometry*, in which latter science synthetical methods are most usually applied. This use of the term prevails on the Continent to such an extent that it must always be taken for granted that *analyse* stands for the algebraical branches of pure mathematics. In this sense it is again subdivided into "algebraical analysis," and "infinitesimal analysis," the latter including the differential calculus. And by "geometrical analysis" is frequently understood the application of algebra to geometry. It must, however, be remarked that the exact sciences have appropriated this word, simply because in these branches of knowledge the use of analysis has been made most conspicuous.

Confining ourselves to the primitive meaning of the term, it is obvious that all discovery must be entirely either the work of analysis or of accident; and that, therefore, geometrical analysis must be as old as geometry; nevertheless this does not appear from the earliest treatises. The work of Euclid is strictly synthetical. Instead of taking the proposition asserted, and examining it by means of preceding propositions, and in the meantime assuming it to be true, in order to ascertain whether the results deduced from it agree or disagree with what has been already proved, Euclid first enunciates the point which he means to establish, and then proceeds to put together the considerations by which it is demonstrated, leaving the learner nothing to do but to judge of the truth or falsehood of each argument as it arises, without taking into consideration the methods by which the arguments themselves were first obtained. This is the natural and proper method of teaching what has already been discovered, for its own sake; not only because it neglects to introduce difficult

and embarrassing considerations, and allows of the subject being broken up into portions which are easily learned at one time, but because there is in reality no perfectly general and certain method of analysis which can be made obvious to the beginner. In attempting the analysis of a new problem, though the discoverer will naturally first try those methods which have been successful in preceding cases, he has no means of assuring himself beforehand which will be successful. The chemist is similarly circumstanced. Let a new substance, or one supposed to be such, be presented to him, from which he is required to find out whether it is already known, or if not, of what it is composed. No effective analysis can commence without requiring the results of all his previous knowledge, for he must have some method of recognizing each and every substance with which he is acquainted, previously to pronouncing whether or not that under consideration is one of them. He must then proceed to trials of that substance with various others, and nothing but the sagacity which arises from previous experience can direct him in his choice of the methods to be employed. No general rules of analysis can be laid down—that is, no process which must end in the discovery of the component parts required. The same observations may be made on mathematical analysis.

The geometrical analysis is generally ascribed to the school of Plato; but in reality, as we have already observed, must be of a date as early as geometrical reasoning itself. The use of problems admitting an indefinite number of solutions, the establishment of the properties of the conic sections, and the various efforts made for the duplication of the cube, and the trisection of the angle, all of which were the work of the school already mentioned, most certainly increased the power of the analyst, that is, made the means of discovery more obvious and more successful; but there is nothing in the methods which entitles them to the exclusive appellation of geometrical analysis.

The peculiar distinction between algebra and geometry is, that the analytical method is pursued in the former from the commencement. The solution of a problem consists in inquiring into the consequences of the solution *supposed to be found*, by introducing at every step some known truth, such as will produce a more simple consequence, and thus reasoning backwards, so to speak, until at last the answer itself is directly produced in numbers, which was before implicitly involved in the conditions of the problem. The methods are more general than in geometry—that is, a larger number of problems may be solved by each process. The same observations apply still more strongly to the higher parts of algebra, and the differential calculus.

The solution of equations of the first four degrees, and the approximation to that of all higher degrees, render the analytical solution of a vast number of common problems a matter of certainty. The solution of differential equations, where that can be done, is an additional step of even a more important character. Within the last half century mathematical analysis has made considerable approaches to a state which enables us to determine, almost immediately, whether a problem can be solved by such means as we possess, or not—no small advantage, when it is considered how much time was previously wasted in the attempt to attain impossible results.

II. ANALYSIS OF SOUNDS. See *RESONATOR*, *ACOUSTICS* (*Compound Tones*).

III. CHEMICAL ANALYSIS is the separation, by various methods, of compound bodies, either into their simpler or their elementary constituents. When merely the number and nature of these are ascertained it is termed *qualitative* analysis; but when their proportions also are determined the analysis is *quantitative*. If the analysis consist only in determining the quantities of the *simpler* constituents of a compound it is *proximate*, as when carbonate of

potash is separated into carbonic acid and potash; but when the operation is extended, and the carbonic acid is resolved into carbon and oxygen, and the potash into potassium and oxygen, the analysis is *ultimate*; for neither carbon, oxygen, nor potassium is divisible into two or more kinds of matter.

The earliest efforts at analysis of compounds were directed solely to the separation of metals from each other, and from their ores. Analysis in the wet way was employed by Boyle, who sought to establish a method of discovering what elements or compounds were contained in any substance of unknown composition. Quantitative analysis was, until the end of the last century, confined to assay of ores. Lavoisier was the first chemist who employed the balance as a means of ascertaining the true composition of bodies. Volumetric analysis, first employed by Descroizelles for the valuation of bleaching powder, is now in common use, particularly in commercial chemistry, the determinations being made by this means with very

great rapidity. Analysis in the dry way, by means of fluxes, was first practised by Professor Pott about 1750.

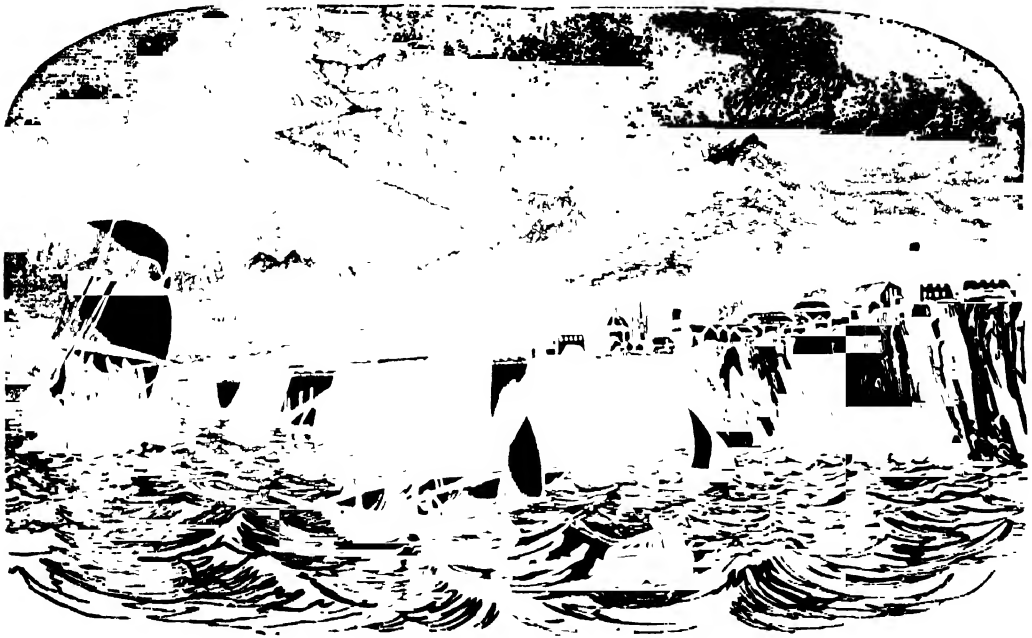
ANAM' or **ANNAM.** See COCHIN-CHINA.

ANA'MOUR, CAPE, the most southern point in Asia Minor, is in 36° 2' N. lat., 32° 50' E. lon. There was formerly a strong castle, which defended it on the only point where it was accessible from the sea. It is named from Anamour, the ancient *Anemurium* a deserted place in the neighbourhood, in which are several ancient tombs and the ruins of two theatres. There is a place called Anamour Castle, six miles east of the cape.

ANANAS'SA, or the Pine Apple, is a genus of the order BROMELIACEÆ, found wild in the woods of South America. The berries are consolidated with the bracts into a compound fruit.

Ananassa sativa is the common pine apple, of which a great number of varieties are known. See PINE APPLE.

ANA'PA, a small seaport town of the province of Russian Circassia, on the Black Sea, lying at the western



Anapa.

extremity of the Caucasus Mountains. It possesses a fortress, erected in 1784 by the Turks, from whom it was several times taken by the Russians, and finally ceded to them. Grain, wax, hides, and tallow constitute its exports, but it has an indifferent harbour. Population about 3000.

ANAPÆST, a foot in Greek and Latin metre, consisting of two short syllables followed by a long syllable. It was sometimes called antidactylus, as being the opposite of the dactyle, which consists of a long syllable followed by two short. Assuming accent in English to be the same thing with quantity in Greek and Latin, the word temporal would be an example of a dactyle, and the word superadd of an anapest. The predominance of dactyles in English, and of anapæsts in French, forms one of the most marked distinctions between the musical character of the one language and that of the other.

ANAPÆSTIC VERSE, a species of verse composed of a succession of anapæsts. Among the Greeks the anapæstic verse was freely used both in tragedy and comedy; some forms of it occur very often in Aristophanes. Both in tragedy and comedy the anapæstic verse

admits also dactyles and spondees. In English only poems of the lighter sort have been usually written in anapæstic verse.

ANAPLI. See NAPOLI DI ROMANIA.

AN'ARCHY (from the Greek ἀναρχία) properly means the entire absence of political government—the condition of a society or collection of human beings inhabiting the same country who are not subject to a common sovereign. Every society of persons living in a state of nature (as it is termed) is in a state of anarchy, whether that state of nature exists in a society which has never known political rule, as a horde of savages, or arises in a political society in consequence of resistance on the part of the subjects to the sovereign, by which the person or persons in whom the sovereignty is lodged are forcibly deprived of that power. Such intervals are commonly of short duration; but after most revolutions by which a violent change of government has been effected, there has been a short period during which there was no person or body of persons who exercised the executive or legislative sovereignty—that is to say, a period of anarchy.

Anarchy is more often used to signify the condition of a political society in which, according to the writer or speaker, there has been undue remissness on the part of those who wield the executive sovereignty. In the former sense *anarchy* means the state of a society in which there is no political government; in its second, and now more usual sense, it means the state of a political society in which there has been a *deficient* exercise of the sovereign power.

ANARRHICAS, a genus of bony fishes belonging to the *BLENNY* division of the *ACANTHOPTERYGII*. Cuvier remarked that they might be regarded as blennies without ventral fins. They have round, smooth, blunt heads; elongated bodies, covered by minute scales; a single long dorsal and an extended anal fin, both separated from the caudal; no ventrals; the mouth armed with formidable teeth of two kinds, conical incisors and flat grinders. One species—the wolf-fish, sea-cat, or cat-fish (*Anarrhicas lupus*)—is common in the northern seas, and in Britain is frequently taken on the east coast of Scotland and the Orkneys, though rare on the English shores. Its range extends to Greenland. It grows to the length of 6 feet, and is a ferocious and formidable animal, destroying the nets of fishermen. When caught it defends itself to its last gasp, inflicting severe wounds by means of its powerful teeth and jaws. It lives chiefly on crustacea and mollusca, and like most fish which subsist on such food, its flesh is excellent eating, though, from the ugly appearance of the animal, it is often rejected. The cat-fish is of a light gray colour, marked with seven or eight broad vertical bands of bluish gray. When old it becomes darker. Its skin is covered with slime.

ANASARCA is the name given to that condition of the body caused by an effusion of watery or serous fluid into the loose cellular tissue under the skin. It is generally due to derangement of the kidneys, and often follows an attack of scarlet fever. It may also arise from diseases of the heart or lungs, the liver, or the lymphatics. It is not regarded as being a disease in itself, but rather as the sign of other complaints; and the treatment is directed to these, though means may be adopted for the alleviation of the inconvenience caused by the swellings. Thus when the feet and ankles are affected some relief may be obtained by keeping them in a horizontal position, and sometimes small incisions are made, and cloths wrung out of hot water applied to promote a gradual oozing out of the water.

ANASTASIUS I., Emperor of Constantinople, succeeded Zeno, A.D. 492, through the interest of Ariadne, Zeno's widow, who afterwards married him. Anastasius was then sixty years of age. He was called *Silentarius*, because he had been one of the officers whose duty it was to maintain peace and silence within the precincts of the imperial palace. The beginning of Anastasius' reign was favourable; he abolished several obnoxious taxes, and checked the abuse introduced by Zeno, of selling the public offices to the highest bidder. He also encouraged men of letters, and was himself a man of some learning. Theodericus, king of the Goths, who, after defeating Odoacer, had made himself master of all Italy, sent an embassy to Anastasius, who recognized his title to the kingdom of Italy, and sent him the purple in token of it. But their good understanding did not last long. Theodericus invaded part of Illyria and Mœsia, and defeated the Greek troops near the river Margus, now the Morava in Servia. Anastasius, on his side, sent a fleet and army, which ravaged the coast of Italy as far as Tarentum, in 508.

On account of his avarice Anastasius became obnoxious to the people of Constantinople, who pulled down his statues and dragged them through the streets; and he was himself assailed with a shower of stones while in the

circus, and with some difficulty saved his life. To add to his misfortunes the empire was attacked by the Bulgarians, the Arabs, and the Persians. The Persians invaded Armenia, and took the town of Amida, or Diarbokr, on the Tigris, but were defeated by Justinus, who afterwards became emperor. A truce was concluded between Anastasius and Cabades, king of Persia, which lasted twenty years. Anastasius, like many other Byzantine emperors, took an active part in the theological disputes of the time, and this troubled his whole reign, and nearly cost him his crown. He died suddenly in 518, at a very advanced age, and was succeeded by Justinus I.

ANASTASIUS II., Emperor of Constantinople. His original name was Artemius, while he was secretary to the Emperor Philippius Bardanes. After the deposition of Philippius in 713 he was proclaimed emperor, sent a new exarch to Italy, and declared himself a follower of the Western Church. Constantinople being threatened by the Saracens, Anastasius, to effect a diversion, sent a large fleet with an army to Alexandria, but the troops revolted, and proclaimed emperor one Theodosius, a receiver of the taxes. Anastasius having retired to Nicæa, in Bithynia, was defeated and obliged to surrender, with permission to retire to a convent and to become a monk. Theodosius III. resigned the crown in 717 to Leo, called the Isaurian. Anastasius, from his convent at Thessalonica, made an attempt to recover the throne, but failed, and was beheaded with several of his followers in 719.

ANASTASIUS I., II., III., and IV. See POPE.

ANASTASIUS, SAINT, surnamed *Astrix*, the apostle to the Hungarians, was a native of France, and was born in 954. After being trained in the monastery of St. Boniface, Rouen, he accompanied St. Adalbert to Bohemia. Having been compelled to leave that country by the opposition of the people, he found a patron in Stephen, the first Christian prince of Hungary, who made him abbot of St. Martin and bishop of Coleza. He possessed great influence, and his whole life was devoted to the propagation of the Christian faith. He died in 1044.

ANASTOMO'SIS (from *ἀνά*, upon, *οἶσιν*, a mouth) signifies the communication of blood-vessels with each other by the opening of the one into the other. All the branches which form such communications are called *anastomosing* branches. So numerous are these anastomosing branches, and so competent are they to carry on the circulation, that if the main trunk of the aorta be tied in the abdomen, or even in the chest, the lower extremities will receive a sufficient supply of blood to maintain their vitality through these collateral or anastomosing branches. The knowledge of this fact enables the modern surgeon to perform with ease and safety operations which in former times would have been pronounced impossible.

ANATASE. See TITANIUM.

ANATHEMA, a Greek word, properly signifying a thing set apart and devoted. Among the Greeks anything offered to the gods, and placed in a temple, was called an *ἀνάθημα* (*anathema*) or offering. But the dedication or setting apart might be to the powers of evil as well as to those of good; or, according to pagan notions, to the infernal as well as to the celestial gods. Hence the word came, in one of its applications, to signify accursed. It is thus that it is principally used in the New Testament. In this sense the form *anathema* (*ἀνάθημα*) was employed, and not *anathema*, though both are really the same word. In the Roman Catholic Church the term is used to express the heaviest form of ecclesiastical penalty, and persons anathematized are regarded as being cut off from all Christian hope, and doomed to eternal perdition. Such a sentence can only be pronounced by the pope, the general council, or a local council of bishops, with their metropolitan. In English we more frequently use the term *anathema* in the

sense of the curse or severe denunciation itself than of the object of the curse.

ANATOLIA. See **ASIA MINOR.**

ANATOLICO, a town of western Greece, built on a rocky island in the midst of the lagoons which form part of the Gulf of Missolonghi. The fishermen of Anatolico use canoes which they call *mono xylo*, "single pieces of wood," formed of the hollow trunks of trees. Its capture in 1826 by the Egyptian troops led to the downfall of Missolonghi, a town now noted as the place where Lord Byron died in 1824.

ANATOMY, in its original acceptance, signified cutting up or dissecting, and was restricted to the investigation of organized structures by the use of the knife. In its modern use it is the name given to the science which treats of the form and structure of organized bodies; and is therefore clearly distinguished from **PHYSIOLOGY**, which considers the functions of living bodies. Anatomy may be said to explain the construction of the machine, and physiology its manner of working. The investigation of the organs and tissues of plants forms part of the science of **BOTANY**, and is termed **Vegetable Anatomy**; the examination of the form and structure of animals, so as to educe their affinities with each other, is termed **COMPARATIVE ANATOMY**; while the study of the organs—their nature, form, and use—of a single animal is called **Special Anatomy**. The latter part of the science is again divided into many branches, each of which is distinguished by its own name; thus the study of the embryo is termed **EMBRYOLOGY**; the examination of the minute structure of the tissues of the body, **HISTOLOGY**; while the name **Morbid Anatomy** is given to the investigation of the changes brought about by the action of disease.

Human Anatomy is the most important branch of medical science. Without it the physician could not ascertain in what organ disease is situated, nor could he successfully examine whether an organ was in a state of health or not. A knowledge of anatomy gives confidence to the surgeon to perform the most formidable operations on the living body, while the want of such knowledge renders the simplest surgical proceeding difficult and dangerous. Hence it follows that the practical investigation of the human frame by dissection forms an essential part of the education of every medical student, and supplies the only trustworthy information which will be of service in practice. So fully is this recognized that ample facilities are now provided for the study under governmental inspection; and in the medical schools of the country excellent opportunities are afforded for gaining a thorough knowledge of the subject. Such anatomical information as comes within the proper scope of this work will be given under such heads as **ARM, BRAIN, EAR, EYE, FOOT, HAND, LEG, SKELETON, SKULL, STOMACH, &c.**

When the anatomy of the various animals is carefully compared most curious affinities are found to occur; and, indeed, this branch of the subject, called **COMPARATIVE ANATOMY**, is the basis of sound zoology; it was recognized as such by Aristotle, and most diligently pursued by him. Comparative anatomy supposes an investigation of the structure of the component organs of animal bodies, a tracing-out of their varied modifications, of their reduction and development, and certification of the presence of some or the absence of others. For ages after the time of Aristotle the science of comparative anatomy was utterly neglected: its importance was unappreciated; but happily in modern days it has received a new impulse, and has been extensively and sedulously cultivated. The zoological systems of Ray and Linnæus are founded more or less purely and naturally on anatomical data. Daubenton worked out the anatomy of the Mammalia for Buffon, and others followed in the same track, till Cuvier commenced

his labours, gave to the world his "**Anatomie Comparée**," his "**Osséimens Fossiles**," and his "**Règne Animal**," and left an imperishable name. Other workers in great numbers have contributed to our knowledge of the subject; amongst these may be mentioned Saint-Hilaire, De Blainville, and Milne-Edwards, in France; Meckel, Von Baer, Gegenbaur, and Haeckel, in Germany; Van Beneden in Holland; Agassiz in America; Owen, Huxley, Allman, Flower, St. George Mivart, Foster, and Balfour, in England.

Anatomy and zoology must go hand in hand. It is on the results of comparative anatomy only that a natural system of zoology can be established. It is anatomy which teaches us how to discriminate on solid data between the great groups of the animal kingdom, and to subdivide them according to their respective conformations. This is the great analytic power in the hands of the zoologist, the test which he must ever apply, and without having recourse to it he can take no step with certainty. It is this science which enables the zoologist to reconstruct, as it were, an extinct animal from the examination of a few of its fossil relics, and to declare what its habits and its general economy were when in far-distant ages it lived upon the surface of our globe; it is this which gives us a key to the hieroglyphic characters presented to us in the form of the fossil relics of races long passed away, indicative of the changes which our planet has undergone; and it is this which exalts our ideas of the vastness and grandeur of creation, of the power and wisdom of the Creator.

ANATOMY, HISTORY OF. Although from the earliest times men must have had opportunities for examining the internal structure of animals, both from those killed for food and those offered in sacrifice, it is difficult to ascertain with any degree of certainty the period when this science first began to be cultivated. The practice of embalming the bodies of the dead, which prevailed among the Egyptians and other Eastern nations, must have required a certain amount of anatomical knowledge. But this would not necessarily extend beyond the large cavities of the body; and while it is impossible to trace the origin of this science, it is tolerably certain that trustworthy evidence does not take us much further back than a few centuries before Christ. The second Hippocrates, who flourished 460–377 B.C., has by many writers been described as the first to treat anatomy as a science; but the critical labours of modern scholars, directed to the works bearing his name, have rendered his claims to the honour somewhat doubtful. That he possessed a knowledge of the structure of the human skeleton is tolerably certain, but his views as to the body generally appear limited, confused, and erroneous. His observations were carefully treasured by his disciples and successors, who added to them from time to time the results of their own observations; but the science was never cultivated systematically until the time of Aristotle, 384–322 B.C. The works of this illustrious philosopher on this subject consist of fourteen books, ten on the "**History of Animals**" and four on the "**Parts of Animals**." He appears to have made careful observations by dissecting the bodies of animals, and he corrected many of the errors of his predecessors. He first described the two great vessels which arise from the base of the heart, and gave the name, which is still retained, of the *aorta* to the principal artery. On the other hand, he followed his predecessors in identifying the nerves with the tendons, and believed they originated with the heart. The next great advance in the science was made by two surgeons of the Alexandrian school, named Xerophilus and Erasistratus, whose works (now lost) were regarded as the text-books of the science until the year 50 B.C., when Celsus, one of the best of the medical authors of antiquity, published his work on medicine. He was a good osteologist, and his descriptions of the various bones display great care and accuracy. A

cheek was put upon the study in the first century of the Christian era, when the dissection of human bodies was forbidden, under heavy penalties, by the Roman government; but during the reign of Trajan a Greek physician named Ruffus made some important discoveries respecting the nerves, and devised a more exact method of naming the various parts of the body than had prevailed before. About the year 130 A.D. the celebrated physician Galen was born; and in his various writings we possess a very accurate account of the anatomical knowledge of that period. He carefully collected from the works of his predecessors all that was valuable, and further extended the science by original investigations of his own. His works were received as of standard authority for a thousand years, and it was not until the fourteenth century that the study began to revive. In 1415 Mindino, a professor of anatomy in the medical school of Bologna, dissected two female subjects, and gave public demonstration of the results. He was followed by other anatomists, among whom may be mentioned the celebrated Berenger, who dissected over 100 human bodies, Columbus Fallopius, and Eustachius, all of whom added facts to the science. The names of the latter survive imperishably in the Fallopiian (uterine) tubes and in the Eustachian tubes of the ear. For a long period Italy was the only country in which any progress was made in anatomy; and though medical schools had long been established in Paris, it was not until the rise of Vesalius, who was the first to write a comprehensive treatise on the subject, that the French school began to attain any eminence in the science. The study, however, was now steadily pursued, and from time to time it was enriched by fresh discoveries or the correction of errors previously maintained. Thus, about 1530, Fabricius of Acquapendente discovered the valves in the veins; and Servetus, a Spaniard (better known as having been burned for heresy by Calvin, at Geneva, 1553), demonstrated the imperiousness of the septum of the heart in 1531, and asserted (in that "Christianismi Restitutio" of his, whereof only three copies now remain from Calvin's fire) that the whole mass of the blood passed through the lungs by the pulmonary artery and vein; and in 1619 William Harvey, an Englishman, finally discovered the circulation of the blood. This discovery marks an era in the history of the art, and it is almost impossible to overestimate its importance. The discovery of the microscope and the use of injections placed additional powers in the hands of investigators, and knowledge advanced with rapid strides to its present high condition. It is impossible, within our limits, even to enumerate the names of the moderns who have added, by their labour, to the knowledge of this subject. France, Germany, Holland, and Italy have all a list of illustrious names, and our own country does not fall behind either of them in this matter.

ANATOMY, LAW OF. Although the practice of anatomy upon the human subject is absolutely necessary to the study of medicine and surgery, it was not until 1832 that sufficient legal means were provided whereby the necessary supply of bodies could be obtained by the profession.

It had been previously enacted that the bodies of persons hanged for murder should be given over for dissection, but the few thus obtained were quite insufficient to meet the requirements of the schools of anatomy, and this defect in the law brought about the existence of evils of a very serious character.

The practice of rifling the graveyards of the bodies of the dead became exceedingly common, and the "resurrectionist," "body-snatcher," or "grab" was encouraged to pursue his ghastly occupation by the high prices offered for subjects by hospital authorities and lecturers upon medicine and surgery. Frequent references to this practice are to

be found in the literature of the earlier part of the present century, while most readers will remember the use made of it by Thomas Hood in some of his grimly-humorous poems, and by Charles Dickens in his "Tale of Two Cities."

Consequences still more horrible came to light in 1828, when the notorious Burke was, owing to information given by his accomplice Hare, tried and executed in Edinburgh for the murder of an old woman. The investigations set on foot by this trial showed that some sixteen persons had been murdered by suffocation, or "burked," for the sake of their bodies, which had been sold to the doctors for dissection. The intense popular excitement attending and following this discovery resulted in the passing of an Act of Parliament in 1832, the 2 & 3 Wm. IV. c. 75, by which the practice of dissection was facilitated, and placed under proper legal supervision. The home secretary for England and the chief secretary for Ireland are empowered by this Act to grant licenses for the practice of anatomy to all properly qualified persons, on the written application of such person, countersigned and certified by two justices of the peace.

The Act also placed the schools of anatomy under inspection, and directed a quarterly return to be made of all bodies used for dissection—such return to distinguish the sex, and, where possible, to give the name and age of the person whose body is so used. Bodies are not to be removed for this purpose until forty-eight hours after death, and twenty-four hours' notice must be given to the inspector or proper medical man. A certificate of the cause of the death must be given by the medical attendant, and anatomists must not receive a body without this certificate, which must also be duly entered in a book kept for this purpose, and open to the inspector. Power is given to relatives to object to the dissection of a body, even when the deceased person has, before death, directed his body to be thus examined or used; and all bodies after use must be decently interred. The penalty imposed for the infringement of this statute is a term of imprisonment not exceeding three months, or a fine not exceeding £50.

It is generally understood that this Act has fulfilled its purpose, and that the bodies of those persons who die without friends in the various hospitals and infirmaries are sufficient to meet the requirements of the medical profession. The Act does not apply in those cases where *post-mortem* examinations are ordered by legal authority.

ANATROPOUS, in botany, is an adjective term applied to ovules and seeds, when these are turned down upon themselves so that the foramen or micropyle is at the base, and the chalaza at the apex connected with the stalk by a cord of vessels (the *raphe*) passing usually between an inner and outer coat. See OVULE.

ANAXAGORAS, a philosopher of the Ionic school, born at Clazomenæ, in Ionia, about B.C. 500. He died about B.C. 428. Born both to rank and wealth he had leisure to apply himself to philosophy, as some authorities say, under Anaximenes; but this opinion is inconsistent with the probable period of Anaximenes. In the twentieth year of his age he went to Athens, where he taught for thirty years. He had among his hearers Pericles, Euripides, Socrates, and Archelæus. In B.C. 450 he was prosecuted at Athens on a charge of irreligion. Pericles succeeded in saving his life, but he was fined and banished. He retired to Lampsacus on the Hellespont, where he died.

The chief treatise of Anaxagoras was on Nature, several fragments of which have been preserved by Simplicius and others. Vitruvius attributes to him a work on Perspective.

The leading notion of Anaxagoras was that all things were in a state of chaos till Nous (intelligence) placed them in order: in opposition to the Ionic philosophers, who had contended that nothing more than the various proper-

fles of matter itself were required to produce the order of Nature. Many views on physical philosophy are attributed to him. The sun, he thought, was a mass of hot iron larger than the Peloponnesus. His opinion that the moon derived her light from the sun was probably not his own. The best edition of the fragments of Anaxagoras is by Schorn (Bonn, 1829). See also Ritter's and G. H. Lewes' Histories of Philosophy.

ANAXIMANDER, the kinsman, pupil, and successor in the Ionic school, of Thales, was born at Miletus in B.C. 610, and died there (as is supposed) about B.C. 547, aged sixty-three. It is reported that he was the first who constructed maps and gnomons, one of the latter of which he erected at Sparta; and that he first discovered the obliquity of the ecliptic. The latter is improbable; though, if he were the first who constructed a gnomon, it is probable that he would also be the first who gave anything like a measure of the obliquity. Some say he thought the earth spherical; others that it had the figure of a drum. At Sparta he is said to have predicted an earthquake which threw down the greater part of the city. Anaximander, as a philosopher, held that matter (*αἰχμη*, the original, in his term) is self-originated, infinite, and divine, but non-intelligent.

ANAXIMENES, the pupil and successor of Anaximander. He was born at Miletus. The years of his birth and death are not known, but he is said to have died about the time of the capture of Sardis, which event, if the capture by Cyrus the Persian is meant, took place B.C. 546. Two epistles of his to Pythagoras are preserved by Diogenes Laertius. Following Thales in endeavouring to deduce all nature from one principle (*αἰχμη*), he held that air was the first principle of all things—that all things were formed of air, and all things at their dissolution were resolved into it. Thales had claimed the same high function for water.

AN'BURY and **CLUB-ROOT**, a sort of gall produced by insects on the roots of cabbages, turnips, hollyhocks, and other species of cultivated plants, and popularly but incorrectly supposed to arise from peculiarities of soil, or from growing the same crop successively on the same field, or to be owing to variations of seasons. They are produced by the deposition of the eggs of a weevil in the part attacked.

No peculiar rotation of crops, nor special manure for dressing the soil, can be of any avail in preventing anbury, or in stopping its progress, when the insects have obtained a lodgment within the roots. The destruction of the adult insects before they have laid their eggs is the only remedy, though in the case of so small a species it is peculiarly difficult to put it in practice. This affection of roots has no connection with *daetylorhiza* ("fingers and toes").

ANCHOR (from *αγκυρα*, and the Latin *anchora*), a heavy iron instrument for fixing a vessel in a harbour or road, thence called an anchorage. Under some form it must have been as ancient as vessels of any magnitude: and it is accordingly mentioned by Greek and Latin authors, by whom also the invention, like many others which from clumsy beginnings have passed through different stages of improvement, is ascribed to various persons. The first anchors were probably only large stones or crooked pieces of wood loaded with heavy weights, but among the Greeks, in later times, they were made of iron; of these the earliest had but one fluke, afterwards the other was added, and finally they were furnished with stocks. Each ship had several, of which the principal one was called *hepa* or *sacred*, and was reserved for the last extremity. This corresponds to that which has since been denominated the "sheet anchor." Although so essential to the equipment of a vessel, anchors were, up to the early part of the present century, so clumsily constructed that but little dependence was to be placed upon them.

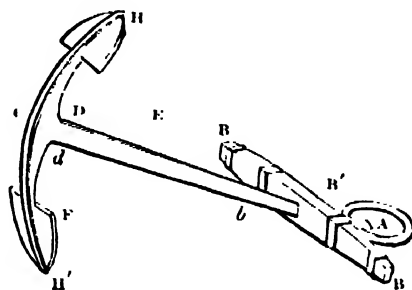
A clerk in the government yard at Plymouth, named Pering, published a book showing that, from the number of broken anchors which came to the yard for repair, there must be something wrong in the workmanship—"undue proportion, or the manner of combining the parts." Mr. Pering so far altered the form as to make the arms curved instead of straight, and besides improving the process of manufacture, used iron of better quality. Since his time so many improvements have been made in the forging of anchors that it is now rare to hear of one failing to stand the strain and other tests in practical use.

In former times the rule in supplying anchors to vessels of the royal navy was to allow 1 cwt. of anchor to a gun, but now the proportion is according to tonnage. A merchant ship of 200 tons having an anchor weighing 10 cwt., 5 cwt. are added for every additional 100 tons; thus a ship of 300 tons would have an anchor of 15 cwt., and so on. Small vessels, however, require heavier anchors in proportion than large vessels. According to Lloyd's rules, for instance, while a ship of 100 tons must have 10 cwt. of anchors, a vessel of 3000 tons need not have, at the like proportion, 150 cwt., but only 128½ cwt.

A large ironclad carries eight anchors—two bower, two sheet, one stream, one stern, and two kedge. The bower anchors are stowed at the bow, and are for ordinary use in a roadstead; the heavier of the two is stowed on the starboard side, and is termed the "best bower." The sheet anchors—which are only used in cases of emergency, or in the event of accident befalling the bowers—are stowed as far forward as possible in the waist of the ship. The stream anchor is for use in a river or sheltered place, where a small anchor is sufficient to hold the ship. The stern anchor is used when it is required to moor at both head and stern, as is the case when there is not room for the ship to swing with the tide. The kedge anchors are usually of different sizes, one large and one small; they are used to warp the ship along a narrow channel, the kedge being carried out in a boat with rope cable attached to it, and dropped; the ship can then be hauled to the anchor. Though still supplied, such anchors are but rarely used in the royal navy, steam-tugs generally performing the service for which they were intended.

The following are the several parts of an anchor:—

A is the ring, B is the stock, D is the shank, C the crown.



C and C' the arms, D the throat, E the trend (C E = ½ C A), F a palm or fluke, B' the small, H the bill or peak; the end of the shank near A is called the nut.

When the anchor is let go in any manner from the vessel's side, the heaviest end, or crown, will tend to become the lowest part, and the whole mass having reached the bottom will most commonly fall upon the crown and on one end of the stock; from this position, therefore, the anchor is to be canted or turned over, so that it may lie as in the figure, before it can hold. Now, it is evident that if the stock were very short, the pull of the cable would tend rather to drag the end of the stock along the bottom

than to lift up one of the flukes, as must be done in canting the anchor; whereas, if the stock were longer, the cable would act with increased leverage, whatever might be the length of the shank. Hence the longer the stock, within the practical limits of stowage, the more certainly will the anchor turn properly; and, when hooked in the ground, the more powerfully will it resist any effort to overset it.

When the anchor has been turned, the stock then, as in the figure, lying horizontally on the ground, and the point of a fluke touching the ground, it is evident that the force exerted by the ship to draw the anchor towards itself, compounded with the weight of the anchor, will produce a resultant force by which the fluke is made to enter the ground and take fast hold.

An anchor is said to be "foul" when the cable is in any way entangled with it; to "come home," when the ship drags it; to be "a-wash," when the stock is hove up to the surface of the water; and to be "a cock-bill," when hanging vertically.

The stock consists of two beams of oak, bolted and hooped together; the length is that of the shank and half the diameter of the ring; it is square; the side at the middle is an inch to a foot of the shank, and tapers to half of this at the end. Such a stock is nearly one-fourth the weight of the anchor. Of late years iron stocks, whose weight is from one-fourth to one-fifth of the anchor, have been much used.

In forging an anchor, care is taken not to render the iron brittle. The effect of the hammer is to harden the surface by compressing it more than the interior. This is remedied by heating the whole to a dark red heat, which by expansion restores the iron to a uniform state, and it is then suffered to cool gradually. This process is called annealing.

The Admiralty anchor (see Plate, fig. 1) differs from the ordinary anchor only in having a nut, A, worked on the square, so that a wooden stock may be temporarily fitted if the iron one is damaged. In Rodger's anchor (fig. 2) the stock is of iron in large as well as small anchors, and is made with a mortise to fit over the shank instead of passing through it. The arms are shorter than usual, in proportion to the length of the shank, and are of a wedge shape, varying in sharpness from the throat to the head of the palms; the back part of the arms is parallel from palm to palm. It is claimed for this anchor that the form of the arms and palms give it great holding power, and that it will bury itself in the soil until the upper palm is bereft of the surface, and consequently is not liable to be fouled by the cable.

An anchor of entirely different construction, and one that has met with very great favour, is that invented by a Frenchman named Martin (see figs. 3 and 4). The arms of Martin's anchor are movable, but they are placed in the same plane as the stock, and both flukes enter the ground at once, thereby giving the anchor double the holding power of those generally in use. It is made wholly without welding, being formed of three distinct pieces of wrought iron. On such an anchor being cast it must fall in the position shown in fig. 3. It is therefore self-canting; and the weight of the arms, together with the pull of the cable, presses their sharp points into the soil so that they take hold immediately. As no part of it projects above the ground, the ship's bottom cannot be injured by it in shallow water, nor can the chain foul it, and thereby cause the anchor to trip. In addition to these advantages it stows much more neatly than any other anchor, and its holding power both arms being embedded at the same time and strength are also very great. In mastless turret ships the facility with which a Martin's anchor can be stowed, owing to stock and arms being in

the same plane, is a decided advantage. The Admiralty allow a reduction of 25 per cent. in weight for this description of anchor, using an 80 cwt. Martin where another of 90 cwt., weighing with its stock from 108 to 112 cwt., would be fitted—the weight given for Martin's anchor including the stock.

In Trotman's anchor (fig. 5) the stock is of iron; the shank is of rectangular section, somewhat larger at the centre than at the ends, and is made fork-shaped at one end to receive the arms (fig. 6); the arms are in one piece, and are connected to the shank by a bolt passing through their centre. The peculiarity of this anchor is that the arms pivot about this bolt, so that when it takes hold the upper fluke is brought in contact with the shank, thus reducing the height above ground, and rendering it almost impossible for the cable to get entangled round it, or, in other words, for the anchor to become foul.

Mooring anchors (see fig. 7) are those which are placed in harbours, &c., for the convenience of vessels frequenting them. A large buoy is attached to the end of the mooring cable, and the ship is made fast to a ring-bolt fitted on the buoy. Mooring anchors are not limited by considerations of weight, &c., as other anchors are, the only requirements being that they have sufficient holding power and do not project above the ground, as any projection in the shallow waters in which they are placed would render ships liable to injury by grounding on them, and be dangerous to fishing nets, &c. Mooring anchors may therefore be of stone, as shown in fig. 9, an old anchor with one arm broken off, or a "mushroom" anchor—so called from the mushroom or basin-like shape of the crown (see fig. 8). The form of the Mushroom anchor does away with the necessity of a stock, as it is equally certain of attaching itself to the bottom, whatever be the direction in which it descends. Small vessels sometimes employ grapnels (fig. 10), which act on the same principle, and have the same advantages as Mushroom anchors.

A good anchorage is where there are from 10 to 20 fathoms of water, and the ground is not rocky or loose sand. Where there are more than about 20 fathoms, the cable bears too nearly perpendicular, and is liable to lift the anchor. For anchoring in ordinary weather the length of cable veered out is about three times the depth of water.

ANCHORITE, a Greek word signifying a person who has retired from the world. Under Christianity anchorites sprung up about the middle of the third century in Egypt and Syria. Paul, commonly called the Hermit, has the credit of having been the first regular anchorite. A distinction, however, came afterwards to be drawn between anchorites and hermits—the former name being given only to those who rigidly confined themselves to their caves or cells, and the latter to those who wandered about at large in the wilds to which they had retired. The most singular kind of anchorites recorded in the history of the church is that which arose in Syria in the fifth century, and of which Simeon Stylites was the founder. This zealot and his followers, instead of resorting to caves, elevated themselves into the air on lofty pillars of stone, on the top of which they passed their lives.

ANCHOVY (*Engraulis*) is a genus of the CLUPIDÆ, to which family also belong the herring, shad, and pilchard. It is characterized by the pointed form of the head, the upper jaw being the longest; the mouth deeply divided; the teeth small or rudimentary; the anal fin rather long; abdomen rounded and silvery; and most are easily known by having a broad silvery band on the side. The greatest length is 8 inches.

There are forty-three species known—inhabitants of temperate and tropical seas. The species used for "anchovy sauce" is *Engraulis encrasicolus*, found

abundantly in the Mediterranean, and also off our own coasts and those of Tasmania. Lucrative fisheries might be established at the latter place, and also, for equally good kinds, off China, Japan, California, Chili, and Buenos Ayres. The greatest quantities are taken on the coast of Dalmatia; but the most delicately flavoured fish are brought from Gorgona, an island near Leghorn. The nets, which are like those used in the sardine fishery, are shot in the night, and all the boats carry lanterns. The fish are packed in salt for exportation, and prepared as "sauce" or "paste" when imported by being dissolved in vinegar.

The anchovy has been celebrated from the earliest times, and a sauce or condiment called *garum* prepared from it was held in high estimation among the Greeks and Romans. In preparing this fish for use the head and viscera are removed, otherwise the pickle would be intensely bitter; the anchovy was in fact once supposed to have the gall in its head.

ANCHUSA, a genus of plants belonging to the order BORAGINÆÆ. The leaves are alternate, rough, and hairy. The flowers are blue, purple, or yellow, arranged like the forget-me-not (*Myosotis*) in one-sided, spiral racemes. The calyx is five-cleft; the corolla funnel-shaped, and closed at the throat by five scales; the four "nits" in the fruit are sculptured at the base. The plants of this genus are natives of Europe, North and South Africa, and Western Asia. Some of the species have been used in medicine, whilst others are employed in the arts for dyeing. Two species are natives of Great Britain—*Anchusa officinalis*, with lance-shaped leaves, and *Anchusa sempervirens*, with ovate leaves. See ALKANET.

ANCIENT, ANCIENTS. The term *ancient* (from the French word *ancien*, and remotely from the Latin *antiquus*), has the primary meaning of "very old," as when we say, "an ancient building," "an ancient family." But it is also used in a more limited sense with reference to a certain period in the existence of the human race; as when we speak of ancient history as distinguished from modern, of the ancient classics, ancient literature, and generally of the *ancients*. The boundary line between ancient and modern in this latter sense is not very accurately drawn; but according to the vulgar acceptance of the terms, the period of the ancient seems to be closed by the overthrow of the western Roman empire. Then arose the rudiments of those independent nations, of those various languages, and peculiar institutions which so remarkably distinguish a large portion of what is called modern Europe from Europe under Roman dominion. There is, of course, a short interval, which may be considered as doubtful ground, for the possession of which the terms ancient and modern will always be allowed to contend.

By "the ancients" we usually understand Greeks or Romans at certain periods of their national history; and even when the term is thus limited there are few assertions which will hold good of "the ancients" generally. For the most part, perhaps, the looseness of the expression is corrected by the subject or the context; but real misapprehension has arisen from the practice of confounding the most dissimilar things under this comprehensive term. The common division of history into two parts, ancient and modern, often conveys the notion of an actual separation which does not exist. The truth is, the history of human civilization is one history, and the subjects of what are called ancient and modern history are so far indivisible that a liberal and comprehensive view of the ancient part is necessary for the profitable study of the modern.

ANCIENT DEMESNE. See MANOR, SOCAVE.

ANCILLA'RIA is a genus of spiral, univalve, marine

shells, allied to OLIVA. The shell is covered with a hard shining coat, and is immured in the large foot of the animal, so that the middle of the back of the shell can be alone discovered. It chiefly differs from Oliva in the spire being very much longer, with its suture not channelled; it is also furnished with a small operculum. There are twenty-three species in the Red Sea, India, Madagascar, Australia, and the Pacific. Fossil species to the number of twenty-one are found in eocene deposits.

ANCIL'LOIN, the name of a French family who migrated from Metz to Prussia after the revocation of the Edict of Nantes. The first to attain to fame was David Ancillon, who was born on the 17th March, 1617, at Metz, where his father was an eminent lawyer. He was a minister of the Reformed Church in his native town from 1653 to 1685, when he was compelled to retire to Frankfort. He afterwards officiated as pastor with great success at Hainau and Berlin, where he died on the 3rd September, 1692. He was the author of several works, principally in defence of the reformed faith.

CHARLES ANCILLON, son of the former, was born at Metz 28th July, 1659, and died at Berlin 5th July, 1715. He was the author of a number of works on political and religious subjects.

LOUIS FREDERIC ANCILLON, grandson of Charles, was born at Berlin in 1740, became pastor of the French congregation in that city, and died there in 1814. Jean Pierre Frederic, his son, was born at Berlin 30th April, 1767. He commenced his public life as pastor of the French community, but afterwards became tutor to the Crown Prince of Prussia. In 1792 he was appointed professor of history to the Military Academy of Berlin. In 1814 he entered the Prussian administration, and became successively counsellor of state, private secretary to the king, and in 1831 he succeeded Count von Bernstorff as minister of foreign affairs. He died 19th April, 1837. He was the author of several works on historical and political subjects, the most important of which was his "Tableau des Révolutions du Système Politique de l'Europe depuis le 15^{me} Siècle" (four vols. Berlin, 1803-1805)—a work combining great learning with keen political insight. Though thrice married he had no children, and with his death the family became extinct.

ANCONA, a province of Italy, bounded on the N. and W. by the province of Pesaro-Urbino, S. by Macerata, and E. by the Adriatic Sea. It was formerly part of the district of the Marches, but as now divided it comprises an area of 740 square miles, and had a population of 267,236 in 1882. There are no hills or rivers of importance. The soil, which is poor, is rendered productive by good cultivation: cattle and sheep are reared, and the vine and mulberry trees grown. Sulphur, chalk, and petroleum are found.

ANCONA, capital of the above province, is beautifully situated on the Adriatic Sea, being built on the slope of a natural amphitheatre which lies between two promontories. The town, which is the most commercial place in the province, possesses railway communication with all parts of Italy, and carries on a considerable trade by sea. Its harbour, which is good, is protected by two moles: the ancient one, raised by Trajan, has a triumphal arch dedicated to him, which is one of the finest in the world; while the modern one, with the lighthouse constructed by Clement XII., possesses an arch erected to Benedict XIV. The citadel, built on a hill, commands the town and harbour, but is itself commanded by the neighbouring heights. Ancona is the seat of a bishop. The cathedral is a very old structure, built outside the town, on the site of the former temple of Venus. The other remarkable buildings are the town hall, the merchants' hall, the arsenal, and the churches of the Dominicans and

the Augustina. The situation of Ancona is pleasant and healthy, the country around is very fertile, and the women are reckoned among the handsomest in Italy. The manufactures consist of silk, leather, wax, tallow, and paper; the chief industries are connected with flour and macaroni. In 1882 the city was provided with a good supply of drinking water. Previously it had depended on a few springs, and often during the hot summer months the inhabitants were obliged to procure water by rail. Ancona has a naval arsenal, and is the only good harbour on the Italian coast of the Adriatic between Venice and Manfredonia, being the common point of departure for the Ionian Islands and Greece. Since it came into possession of the Italian government the town and harbour have been very much improved, the latter by dredging, and by the construction of a quay for the special use of large vessels. The population in 1882 was 46,090. There is an active import and export trade, the value of the former being nearly £1,000,000, and of the latter £300,000 per annum. The imports consist of coal, minerals, manufactured goods, sugar, spirits, tanned skins, and oil; and the exports, of grain, rags, and manufactured goods.

Ancona is said by Strabo (p. 241, Cassaub.) and Pliny to have been built by some Syracusans who fled from the tyranny of Dionysius. Juvenal calls it a Dorian colony; it is probably older than the date assigned to it by Strabo. The name of *Ancon* (ἀγκών) means an elbow, such being the shape of the neck of land on which it is built. The Romans made it one of their principal naval stations on the Adriatic. In the middle ages it governed itself as a republic under the protection of the popes until 1532, when Clement VII. made himself absolute master of the town. The French occupied it in 1797, and it was retaken by the Austrians in 1799, after a long siege. The French took possession of the citadel again in 1832, and did not evacuate it till 1838. During the revolution of 1849 it was besieged and taken by the Austrians, and held by them in the name of the pope until 1859. It was then garrisoned by 3000 Germans and Swiss under General Lamoricière. In 1860 it was besieged by the Piedmontese under General Cialdini, and on 29th September was obliged to capitulate.

ANCRE, MARECHAL and **MARQUIS D'.** To this high military rank and title was raised a poor and obscure Florentine gentleman of the name of Concini dei Concini, son of a notary. He came to Paris in the suite of Maria de' Medici, whom Henry IV. of France espoused after he had repudiated Marguerite de Valois. Concini soon after his arrival married Eleonora Gligli, one of the queen's women of the chamber. On Maria de' Medici becoming regent, after the assassination of Henry IV., Concini, by her favour, rose to almost unlimited power. But this sudden elevation, together with his insolence to the young king and his overbearing manner to the nobles, were the cause of that hatred which brought him to a dreadful end. A young man of the name of Luynes (known afterwards as Due de Luynes), who was in great favour with the young king, persuaded him to deliver the queen-mother from the power of her favourite, and urged his insolent bearing to the nobility, and his pernicious influence, with so much success that at last Louis XIII. ordered the *Maréchal* to be arrested, and even to be put to death if he resisted. Vitry, a captain of the king's guard, was intrusted with this commission, which he executed to its fullest extent. D'Ancre was shot dead as he was entering the palace of the Louvre. The body of the murdered man was first secretly buried at St. Germain l'Auxerrois, but was soon afterwards torn from the tomb by the infuriated mob, who dragged it through the streets on hurdles, and finally burned it before the statue of Henry IV. Eleonora soon shared the misfortunes of her husband. She was convicted of sorcery, and was executed July, 1617.

ANCUS MARCIUS, the fourth king of Rome, reigned, according to tradition, 640 to 616 B.C. To him is assigned the honour of laying the first foundation of the *plebs*, or communally, that important element in the state to which Rome, under the Commonwealth, owed nearly all her greatness. His predecessor, Tullus Hostilius, attentive solely to war, had neglected the religious institutions established by Numa. Ancus Marcius, whose mother was the daughter of Numa, restored the neglected rites, and endeavoured to imitate the pacific policy of his grandfather. But the neighbouring states, mistaking his love of peace for timidity, provoked him to hostilities by aggressions on the Roman territory. In the successive wars with the Latins, the Veientes, and other states, which ensued, he was invariably successful. From the Latins he took the towns Politorium, Tellenæ, Ficana, Medullia, and transferred their inhabitants to his capital, giving them the Aventine as a place of abode. These Latin towns are supposed to have been situated between Rome and the coast; and indeed the conquests of the king extended to the mouth of the Tiber, where he established the colony of Ostia. In his war against Veii he was equally successful; and to protect his people on that side he fortified the Janiculum, and connected it with the city by means of the Sacred Bridge, called the Pons Sublicius (*aublier*, piles), in the construction of which no brass or iron was used. This bridge lasted until 23 B.C., when it was carried away by an inundation of the Tiber, and its place was supplied the following year by a stone bridge erected by the censor Æmilius Lepidus. A still more durable monument connected with the name of Ancus is the Mamertine Prison, excavated from the rock, in that side of the Capitoline Hill which overlooks the Forum, and still extant. Jugurtha, some of the Catiline conspirators, and Sejanus, amongst others, were put to death here, and tradition points it out as the prison of St. Peter and St. Paul.

ANCYLUS. See RIVER-LIMPET.

ANCYRA. See ANKARA.

ANDALU'SIA or **ANDALU'CIA**, the most southern territory of Spain, comprises the former Moorish kingdoms of Seville, Cordova, Jaen, and Granada. It is now divided into the eight provinces of Seville, Huelva, Cadiz, Jaen, Cordova, Granada, Almeria, and Malaga. It was known to the Romans as *Bætica*, and is probably the Tarshish of Scripture. It is situated between 36° 2' and 38° 39' N. lat., and 1° 38' and 7° 20' W. lon.; is bounded on the N. by La Mancha and Extremadura, on the E. by Murcia, on the S.E. by the Mediterranean, and on the W. by Portugal. Its length is over 800 miles, and its average breadth 98 miles—the area being 33,000 square miles. The country is intersected by various mountain ranges; the principal are the Sierras Morena and de Arsoche in the north, the Sierra Susana in the centre, and the Sierras Nevada, de Gador, and Bermeja in the south. Several peaks are of great height, and are covered with perpetual snow. In the Sierra Nevada the chief are Mulhacen, 11,781 feet high, and the Picacho de Veleta, 11,597.

The Guadalquivir is the largest river in Andalusia. It rises in the eastern part of the country, and flows through its centre in a south-westerly direction, receiving various tributaries in its course. Other rivers are the Guadalete, the Tinto, and the Guadaljara.

The plains of Andalusia, notwithstanding their situation in one of the warmest climates of Europe, are still, generally speaking, of a moderate temperature. On the northern side of the Sierra Morena the productions indicate a climate like that of the south of France; but southward of that range the climate is the hottest in Europe, and there are found the mastic tree, the kermes oak, myrtles, American aloes, palm trees, the olive, the banana, the caper, orange and lemon trees, the pomegranate, and other

productions of warm climates; and in some spots the sugar-cane and cotton grow. The orange and lemon trees form groves of considerable extent, which in the time of blossoming fill the air with a delicious perfume. At that season the inhalation of so many odours, in which the balsamic perfume of the cistus is distinctly perceived, especially before and after sunset, gives a delightful sensation of the salubrity of the air. Agriculture is in a very backward state, although the soil is so productive, particularly in the plains, that the husbandman with very little trouble may obtain an abundant harvest, and the country was formerly famous as the garden and granary of Spain. In the west there are considerable tracts uncultivated and uninhabited, owing to the want of water. In addition to the various species of fruit and corn, the chief products of the country are wine and oil. Among the wines the Xerez (or sherry), the Pajarete, Malaga, Montilla, Espasa, Bornos, and Tintilla are the most celebrated.

The rich pastures of the mountains and valleys feed innumerable herds of cattle, among which the bulls have long been renowned. The sheep yield very fine wool. The woods of oak of the Serrania de Ronda, of Cordova, and Granada afford nourishment to a multitude of hogs; and the Loma de Ubeda, the Dehesa of Cordova, and the Cartuja of Xerez produce the finest breed of horses in the peninsula. The seas and rivers abound in fish, and the mountains in every species of game. The wolf and the boar are the only ferocious animals. Among the reptiles and insects the scorpion, the tarantula spider, the chameleon, and some snakes, though none of the worst kind, are found. The riches of the mineral kingdom are no less abundant. The mines produce gold, silver, copper, iron, lead, loadstone, coals, vitriol, and sulphur. Large quantities of marble of a fine quality, and quartz, are also found.

The people of Andalusia, who were originally probably of African origin, appear to be a mixture of the different nations which have successively had the dominion of this region—the Carthaginians, the Romans, the Vandals, and the Goths. The Moors invaded it in 711, and it was not until 1491 that they were expelled from Granada, their last stronghold. Notwithstanding their expulsion many traces of them are still discernible. The language, for example, is not pure Spanish, but is intermixed with Arabic; while the name of the country is believed to be derived from the Moorish *Andalash*, "land of the west." It is, however, also said to be called after the Vandals, being a corruption of *Vandalusia*. The Andalusian, inhabiting one of the finest climates in the world, where nature so liberally yields its riches, is rather indolent in character—at least in the plains; but in the hilly districts the inhabitants labour like other mountaineers. The men are fine and well made, and the women are remarkable for the gracefulness of their forms, for their expressive, large, and black eyes, and for their small, delicate feet.

ANDAMAN ISLANDS are situated in the Bay of Bengal, in lat. $11^{\circ} 41' N.$, and $92^{\circ} 42' E.$ lon., 590 geographical miles from the Hooghly mouth of the river Ganges, and 160 from Cape Negrais, in British Burmah. They lie nearly due north and south, and consist of the Great and Little Andaman groups, surrounded by a number of small islands. The former comprises four islands—Northern, Middle, and Southern Andaman and Rutland Island—separated by narrow straits, and extend over an area of 166 miles in length by 20 in breadth. The Little Andaman lies about 30 miles south of the former group, and is 28 miles long by 17 broad. Coral reefs surround the islands on all sides. Port Blair, the chief settlement, is on the east coast of the southern island of Great Andaman, and is placed at the head of a fine inlet of the sea, forming a

magnificent harbour 9 miles in length. In this inlet or harbour are three islands, the first and most important of which, Ross Island, lies just across its mouth. Chatham Island is 3 miles up, and Viper Island 3 miles further up still. The three islands, and nine other places on the mainland, are used as stations for convicts from India who have been sentenced to imprisonment for life. The convict stations on the mainland are all—with the exception of one at Port Monat, on the western side of the island—situated round the sides of Port Blair harbour. Ross Island forms the capital of the settlement, and contains the government house, principal store-houses, and well-cultivated plots. Viper Island is reserved chiefly as a punishment station for the most abandoned and refractory of the convicts. A very excellent though strict system is carried out, and considering the large number of criminals collected in one place the local crime is but small. The chief occupations of the convicts are clearing and preparing the thickly wooded ground for cultivation and building purposes, unloading cargo, evaporating sea salt, cutting firewood, &c. What was formerly almost a desert of unproductiveness has now been by this labour rendered a fine scene of fertility and beauty. Cattle have been introduced, and fruit trees extensively planted, with good results.

The most northerly islands are the Great and Little Cocoas, so called from their enormous yield of cocoa-nut trees. On the North Andaman the most prominent feature is the Saddle Hill, which reaches the height of nearly 3000 feet. From here to Port Blair the Calcutta steamer threads its way through a host of islets, which contribute to make the scene uncommonly striking and grand, many of them rising very high, and being clothed to their summits with gorgeous verdure.

The highest eminence on South Andaman is Mount Harriet. It was whilst standing on its summit, just before his assassination in 1872, that Lord Mayo pronounced the view unsurpassed in his experience, and predicted a great future for the Andaman settlements. The climate, which has been immensely improved by the removal of jungle and reclamation of swampy land, is now, although very moist, genial and healthy—cool sea-breezes prevailing nearly all the year. May to October is the rainy season, the annual rainfall being about 120 inches. The annual mean temperature, reduced to sea level, is about 81° Fahr. The productions of the islands include timber of sufficient size for ship-building, cotton, and sugar. Fish is abundant. Turtles are plentiful, and supply the Calcutta market.

A settlement was attempted by the English in 1791–92 at Port Cornwallis (now Port Blair), but it was not till 1858 that any serious attention was turned to the Andamans. Dr. Mouat having then reported their suitability as a place of transportation for the mutineers, they were used as such, and are now (with the Nicobars since 1869) the chief penal colony of India. These two groups are under the control of a chief commissioner residing at Port Blair.

The aborigines of the Andaman Islands, who are a race of negroes, have been completely left behind in the progress of civilization. They are, as a rule, destitute of any clothing, are splendid archers and fishermen, and very skilful in swimming and diving. Though formerly very hostile, they are not now vindictive, and are capable of strong attachments. A curious remedy against the effects of the climate, in the shape of daubing their bodies with mud and turtle oil, was formerly much practised; the mud daubing is still used in mourning, and as a protection against the heat of the sun and the bites of insects. Their shelter consists of rude leaf huts, but the government, by the erection of sheds in the vicinity of the settlements, is

endeavouring to improve their condition. A remarkable peculiarity of these people, "as an expression of reconciliation with enemies, and of joy at meeting friends after a long separation," is crying. Their language is deficient in words, and has no numerals, and differs in various islands. Single marriages are the custom, and children are named before birth. The present number of the natives is estimated at 10,000.

ANDANTE, one of the principal *tempi*, or pace indications in music. It literally means "walking," and is used to express a central pace, neither quick (*allegro*) nor slow (*adagio*). It bears many qualifying adjectives—the most important being *sostenuto* (sustained, generally a little slower also), *con moto* (with movement, briskly), &c.

ANDANTINO, rather quicker than *andante*—practically the same in pace as *allegretto*, but indicating a rather graver character.

ANDELYS, LES, a town of France, in the department of the Eure. It stands in the territory of the Norman Vexin, on the right bank of the Seine, about 20 miles north-east of Evreux, and has a tribunal of first instance and a population of 5000, who manufacture cloth, cotton hosiery, linen, pipes, sabots, woollen and cotton yarn, and leather. The town consists of two parts, Petit-Andely and Grand-Andely. Petit-Andely stands close to the Seine, which is here spanned by a fine suspension bridge of a single arch. Grand-Andely is about half a mile inland; it has a very ancient Gothic church, and a monument to Nicolas Poussin the painter, who was born here in 1594. On an eminence above the town stands the still majestic ruins of Richard Cœur de Lion's famous fortress of Château Gaillard.

ANDERNACH, a small town of Rhenish Prussia, on the west bank of the Rhine, about 10 miles W.N.W. of Coblenz. It has some trade, chiefly in lava mill-stones—which are cut in the neighbouring villages of Ober Mendig and Nieder Mendig—in bricks, clay for tobacco pipes, and in trass, which is sent to Holland. This trass is an indurated volcanic mud, of which a vast quantity is accumulated in the valley of Brohl, 5 miles north of Andernach. It is extensively quarried, and when pulverized and mixed with lime makes a mortar suitable for constructions under water. Trass is a corruption of the Dutch word *tiras*, which signifies cement. In Andernach numerous pieces of columnar basalt are employed as posts at the corners of streets, &c. There are several mineral sources near the town. The vine is cultivated in the neighbourhood. The whole district in which Andernach stands was at some very remote period the seat of many active volcanoes, and is very interesting to geologists. It is the *Antunnacum* of the Romans, and was in the middle ages a fortified town. It has a fine church, dating from the thirteenth century, a watch-tower and gateway, and also a gymnasium. Population, 4800.

ANDERSEN, HANS CHRISTIAN, a Danish poet, dramatist, and novelist, and the most popular writer of story books for children of modern times, was born at Odense, in Funen Island, on the 2nd April, 1805. His father was a shoemaker in very humble circumstances, but a man of an affectionate disposition, and fond of reading and meditation. His mother was a pious and affectionate woman, and after his father's death, which happened when Hans was very young, she supported herself and her only child by going out to wash. The young Hans, after working for a time in a manufactory, endeavoured to obtain a situation in the theatre at Copenhagen, but was not successful, and afterwards attempted singing, but had to abandon it when his voice broke. He was assisted, however, by several kind friends, who had noticed his abilities; and after he had offered a tragedy to the directors of the Theatre Royal, the king, Frederick IV. allowed him a yearly

stipend, which enabled him to complete his education, and gave him the necessary leisure for the preparation of his works. His first book, entitled "Foot Journeys to Angar," was published in 1828. This was followed by a volume of poems in 1831; and in 1833-34, having been enabled to take a tour in Europe, he published his romances entitled "Agnes and the Mermaid" and the "Improvisatore." His subsequent works included novels, dramas, and poems; but his greatest successes were obtained in his inimitable fairy tales, which have been read all over Europe and America, and have equally delighted both old and young. In April, 1875, his seventieth birthday was celebrated with much national rejoicing. He died the 4th of August the same year.

ANDERSON, JOHN, the founder of the Anderson's College, Glasgow, and one of the earliest promoters of that popular instruction in science which has so greatly elevated the character of British artisans, was born in the parish of Roseneath, Dumbartonshire, 1726. He was left an orphan at an early age, and was educated at Stirling by an aunt. He received the more advanced branches of his education in the University of Glasgow; and in 1756 was appointed professor of Oriental languages there, but in 1760 was removed to the chair of natural philosophy. Not content with the ordinary duty of lecturing, he employed himself indefatigably in studying and exemplifying the applications of science to the useful arts, visiting for this purpose the workshops of intelligent artisans, and exchanging his scientific information for their experimental knowledge. The better to carry out his views of popular education, Anderson commenced, in addition to his ordinary class, one which he styled his *anti-toga* class, for the instruction of artisans and others unable to enter upon a regular academical course, to whom he delivered familiar extempore lectures illustrated by experiments. Mechanics were allowed to attend these lectures in their working dress.

Anderson closed his useful career on the 13th of January, 1796, in the seventieth year of his age, after a connection with the university of upwards of forty years. Shortly before his death he devised his whole property to eighty-one trustees, for the establishment in Glasgow of an institution to be denominated Anderson's University, for the continued provision of those facilities for the unacademical classes of his townsmen which he had so long supplied by his own personal exertions. His comprehensive design was for an institution consisting of four colleges, with nine professors each, for arts, medicine, law, and theology; but as the funds proved insufficient for so extensive a scheme, operations were commenced in 1797, on a limited scale, by the appointment of Dr. Thomas Garnett as professor of natural philosophy. His first course of lectures was attended by nearly a thousand persons, of both sexes. In the following year professors of mathematics and geography were appointed; and though the institution had not attained the magnitude contemplated by the founder, it had progressively increased and extended in usefulness, and had been productive of much public benefit. Dr. Garnett was succeeded in 1799 by Dr. Birkbeck, on occasion of his removal to the Royal Institution in London, which was formed on a similar model to that established by Anderson; and Dr. Birkbeck, who introduced a new course of instruction for five hundred operative mechanics, free of all expense, was succeeded in 1804 by Dr. Ure. Since that time this institution has attained a celebrity and usefulness somewhat resembling the aims of the benevolent founder. It is principally known as a flourishing school of medicine, having a staff of professors in the different branches of medical science, and is resorted to by large numbers of medical students not only from Glasgow, but from many parts of Scotland, England, Ireland, and

the Colonies. In 1870 Mr. Young of Kelly settled in trust the sum of £10,500 for the purpose of establishing a chair of technical chemistry. A school of mines has been opened within its walls, which is a great boon to the community. The public lectureships on chemistry, natural philosophy, and anatomy have been placed on a permanent basis by the generosity of Mr. Freeland of Gryffe Castle, who has established a fund for the endowment of the lectures on these branches; so that mechanics, young men in business, and the public in general are secured permanent courses of these subjects at a nominal fee, which goes to support the Mechanic's Library, which is free to those attending the popular classes.

Coincidentally with the establishment of these public lectureships, great improvements have recently been made in the buildings of the university. The Museum, which contains a most admirable collection of objects of natural history and antiquities, is now placed in a magnificent hall, with a noble cupola; while in apartments on either hand are museums of natural philosophy and chemical products. New class-rooms have been built, and altogether the establishment is in a state so excellent that the heirs of the founder have much reason to be proud of him who has reared for himself such a valuable educational monument.

ANDES, the general name given to the great range of mountains which runs along the western side of the continent of South America, and which is called by the Spaniards the *Cordilleras de los Andes*, or chains of the Andes. The derivation of the name does not appear to be known with any certainty; Humboldt believes it has been lost. It is a curious fact, mentioned by Colonel Tod, that the same name is applied to the Himalayahs by the Hindus. We may fix the southern extremity of the Andes in the Rocky Islands of Diego Ramirez, off Cape Horn, in 56° 30' S. lat., and their northern termination at the Isthmus of Darien. The width of this vast range varies from about 60 to 300 miles. The Andes, although in our maps they look like one long single ridge, are by no means so, but are composed of a series of chains of mountains, more or less parallel, inclosing vast elevated plains or table-lands, and of several great groups, like knots or articulations, at distant intervals. For the convenience of description we shall divide the range into five parts, marked by the political divisions of the continent, and shall call them the Andes of Patagonia, of Chili (including those of Bolivia), of Peru, of Ecuador, and of Columbia.

The *Andes of Patagonia* extend from 56° to 42° S. lat., or about 970 miles. Cape Horn, which may be seen distinctly at 60 miles' distance, is about 8000 feet high. The greatest heights in Terra del Fuego lie about the centre of the Strait of Magellan, and some of these reach nearly 7000 feet in height; but the average of the whole range is about 3000 feet. South of 40° S. lat. the Andes, instead of leaving a belt of land between their base and the sea, press close on the ocean, and thus assume a new character, which they retain to the very extremity of the continent. North of 40° we find a long unbroken shore, affording neither shelter for vessels nor landing for boats. The highest points of the Patagonian range are—Yanteles, an active volcano, 8030 feet; Minchinmadiva, 8000 feet, also active; and Mount Darwin (Terra del Fuego), 6800 feet.

The *Andes of Chili* lie between 42° and 24° S. lat., an extent of about 1200 miles. Towards the centre of the chain stands the huge mass of Aconcagua, an extinct volcano, the culminating point in the New World, towering to the height of 28,200 feet. Tupungata is over 20,000 feet, and El Descabezado 18,800 feet. On the summit of the latter is a plain 6 miles in diameter. There are several passes across the ridge, the most important of which are those on the great line of road between Buenos Ayres and the port of Valparaiso on the Pacific. These mountain

passes lie between the city of Mendoza in the eastern plain and Santiago, the capital of Chili. From Mendoza, which is 4486 English feet above the level of the sea, to La Cumbre (that is, the summit) the road ascends to the height of 12,700 feet, and from thence there is a gradual descent to the city of Santiago, which is 2614 feet above the Pacific.

Between 33° and 24° S. lat. two great mountain chains form as it were buttresses on the eastern side of the range. The one, called the Sierra de Cordova, lies between 33° and 31°, advancing like a promontory into the pampas or plains east of the Andes; the other, called the Sierra de Salta, which has a general direction parallel to the other, lies between 28° and 21°, and extends 400 miles eastward. In the Chilian Andes the steep face is on the eastern side, to which there is not a progressive ascent, as on the western side from the Pacific. The breadth in this part of the range is very various.

The *Andes of Peru* comprehend that part of the range between 24° and 6° S. lat., a space of about 1250 miles. Their southern extremity is situated in the republic of Bolivia, which includes the ancient provinces of Upper Peru. This portion has a general N.W. direction. Near Potosi (about 20° S. lat.) the range separates into two great branches, called the Eastern and Western Cordilleras of Bolivia. The two branches meet again at about 15° S. lat., after inclosing a vast table-land. The eastern branch, which was formerly believed to contain the loftiest mountains of the Andes, has several elevated peaks, among which are the Sierra Nevada de Illimani, eastward of the city of La Paz, 21,200 feet above the level of the sea, and the Sierra Nevada Srata, 21,300 feet. In the main or western branch are also some prominent heights—Schama and Chungara, each about 22,000 feet; Chlipicani and Arequipa, both over 18,000 feet; and Chuquibamba, 21,000 feet. The table-land included between the two branches, known as the valley of the Desaguadero, has an elevation of 12,700 feet above the sea, containing an area of 3500 square leagues, covered with fruitful fields and populous towns. Here is situated the great Lake of Titicaca, which is inclosed on every side, and there being no outlet the waters which flow down from the surrounding mountains into the lake must be carried off solely by evaporation from its widely-extended surface.

From this portion of the Andes springs a lateral branch, the Sierra Nevada de Cuchabamba, which runs eastwards far into Bolivia, and divides some of the affluents of the Amazon from some of those of the Plata.

The table-land terminates on the north at the group of Cuzco, a vast assemblage of mountains, having an extent of surface three times as large as the whole of Switzerland, and with a mean height of 8300 feet. It is in this group that the upper streams of the Amazon have their source. Proceeding N.W. from this group, a second bifurcation of the range takes place, inclosing another table-land, 11,000 feet high. This terminates in the group of Pasco, northward of which the Andes separate into three parallel chains, again uniting at the group of Loxa, about 5° S. lat. The Peruvian Andes are separated from the Pacific by a sandy desert 120 miles broad.

The *Andes of Ecuador*.—At the northern limit of the group of Loxa the main range divides into two subordinate chains, which inclose the longitudinal valley of Cuenca by their uniting in 2° 27' S. lat., to form the group of Assuay, which last contains a table-land at an elevation of 15,520 feet, almost within the region of perpetual snow. To the north of this group another bifurcation had long been believed by geographers to exist, but the explorations of Mr. Whymper utterly disproved the presence of any such parallel ranges. In this portion of the Andes occur the great mountains of Chimborazo, 20,517 feet;

Cotopaxi, 19,500; Antisana, 19,260; Cayambe, 19,200; Illiniza, 17,120; Sincholagua, 16,365; Sara-ureu, 15,500; and others. These heights are in the vicinity of the vast table-land of Quito, and in no other part, except perhaps in the Bolivian Andes, is there a collection of so many colossal and imposing mountains. Chimborazo, the height of which was calculated by Humboldt at 21,124 feet, has by subsequent measurements been found to be less lofty, and thus has given rise to the supposition that it is gradually subsiding.

The *Andes of Columbia*.—Northward of the table-land of Quito the Andes bend rather more to the east, forming the group of Los Pastos, and at Almaguer they again separate into two branches. The eastern branch spreads out to form the group called Paramo (desert) de los Papas; and this group in its turn sending off two branches, we have the Andes now divided into three subordinate chains, viz. the eastern, central, and western cordilleras of Colombia. The eastern cordillera extends towards Santa Fé de Bogota and the Sierra Nevada de Merida, east of the Magdalena river; the central cordillera runs parallel with the eastern to 5° N. lat., forming with it the sides of the valley of the Magdalena, and it continues to divide that river from the Cauca until their junction in 9° 23' N. lat.; the western cordillera separates the valley of the Cauca from the low country of Choco, which last forms the eastern shores of the Gulf of Panama. Among these mountains are the Pic de Tolima, 18,314 feet, and others always covered with snow; and there are also elevated plateaus, from 8000 to 9000 feet in height, on which are built the cities of Santa Fé de Bogota, Tunja, Sogamoso, and Lira.

The Andes terminate at the northern end by a junction with other ranges which proceed east and west through Venezuela. Near this junction is a vast group, called the Sierra Nevada de Santa Marta, spreading over a country 45 miles in width, and having peaks 19,000 feet high.

The higher regions of the Andes present themselves under three different forms:—1. The active volcanoes, such as Cotopaxi, which have only one crater of vast dimensions, and which are conical mountains, with summits more or less truncated. 2. Those which, having been torn by a long succession of eruptions, have a jagged outline, being composed of numerous sharp points, like what are called needles in the Alps. 3. The rounded form, like Chimborazo, the most majestic of all, which, when seen from the Pacific, in a clear state of the atmosphere, stands prominently out from all the surrounding mountains. The Andes appear as a chain only when seen from a distance, for the inhabitants of the inclosed elevated table-lands see the mountains only as isolated peaks of moderate height. The valleys of this great mountain system are truly sublime, deeper and narrower than those of the Alps and Pyrenees, they present situations so wild as to fill the mind with fear and admiration. They are formed by vast rents, clothed with a vigorous vegetation, and of such a depth that Vesuvius might be placed in them without overtopping the nearest heights. Thus, the sides of the celebrated valleys of Chota and Cutaco are 1875 and 4225 feet in perpendicular height; their breadth does not exceed 2500 feet. As the whole chain runs comparatively close to the west coast, the rivers which fall into the Pacific are necessarily short and rapid.

Geological Formation.—The Andes of Peru and Chili are those which have been most examined with respect to their geological formation. Among the stratified rocks gneiss is found at intervals throughout the greater part of the range, often associated with granite, and passing into mica-slate. It frequently contains large quantities of garnets. Mica-slate is, next to porphyry, the rock of most frequent occurrence in the Andes. In the Nevada de Quindiu of New Granada it attains a thickness of more

than 3800 feet; in some places there are beds of granular limestone occasionally resembling the finest Carrara marble. Not far from Popayan it contains beds of quartz and also of gypsum. Clay-slate is found immediately under secondary formation in the table-land of Santa Fé de Bogota, and south of the equator it serves as a basis to the porphyry in the Andes of Quito. It is found immediately beneath a secondary limestone at the height of 12,800 feet in the ridge of the Andes of Peru. Quartz occurs among the Peruvian Andes, of the enormous thickness of 6000 feet, and there and elsewhere it covers many leagues. It contains gold, mercury, sulphur, and specular iron in many places.

Red sandstone occurs in vast quantity, both among the Andes themselves and also eastward of the range. It assumes all the varieties of texture from coarse conglomerate to fine-grained sandstone. Near Quito the red sandstone has a thickness of more than 5000 feet. The plains of Venezuela are composed of a series of secondary rocks, the lowest of which is a red sandstone, or conglomerate of rounded fragments of quartz and flinty slate united by an argillaceous cement, sometimes of as vivid a red as cinabar. This sandstone appears at the surface over the greater part of the llanos, but towards the east it is covered by beds of limestone and gypsum. Beds of coal are found among the sandstone at Santa Fé de Bogota and at Huancu—the latter at 14,760 feet high, the greatest altitude where coal has yet been met with.

The red sandstone of New Granada is covered by lamellar gypsum and by fetid limestone, and at various parts of the range interlayers of different strata occur. Near Zipaquira rock salt is associated with gypsum and limestone; while in other parts it is in near vicinity to galena, to porphyry, and to other mineral bodies. The red sandstone of the llanos of Venezuela is covered by a whitish-gray compact limestone; and a similar limestone is met with in various parts of the Andes of Peru, at elevations from 9000 to 14,000 feet; and near Pasco, in the Andes of Peru, at the height of 12,800 feet.

Granite, which in the old continent rises to elevations of 15,000 feet, is never found at great heights in the Andes, and indeed forms but a small part of their external surface. Porphyry is by far the most widely extended of all the unstratified rocks of the Andes.

Another kind of unstratified rock is trachyte, which is a hard rock with a granular basis of glassy felspar, and including separate crystals of glassy felspar, usually with a mixture of hornblende, and often mica; and these materials are united in so many different proportions as to produce rocks of very different aspects. Trachyte occurs throughout the whole range of the Andes of Chili, Peru, and Columbia; often in columns of great regularity, as in Chimborazo, where it is met with in slender prisms, of 50 feet long.

Glaciers exist in the Patagonian Andes, and also in Ecuador.

Volcanos and Earthquakes.—No part of the world has been subjected to greater revolutions from volcanic fires than the range of the Andes. All the volcanoes, whether extinct or active, have burst forth amidst porphyries, basalts, and trachytes. Most of the lofty summits of the range are composed of trachyte, and the opening is usually in the latter rock. Many of the volcanic rocks now met with are supposed to be fused masses of rocks once stratified; while others are mineral nodules which have been softened by heat. Pumice-stone, which is nothing more than obsidian frothed up by the admission of air or watery vapour to it when it was in a fluid state, is found to a great extent in many of the volcanoes of the Andes; and volcanic tufa, which is a stone more or less compact, made up of fragments of hard lava, clinders, and ashes agglutin-

ated together, covers immense tracts on the flanks of the Andes and on the table-lands. Snow, melted by the heat of the volcanos, often washes down fragmentary rocks in torrents; and the water, mixing with loose earth, forms mud, which is sometimes driven up as a mud-volcano.

The most considerable volcanos of the Andes are situated not far from each other in the province of Quito.

They are Cayambe, Cotopaxi, Pichincha, Antisana, L'Altar, Sangai, and Tunguragua. Cayambe is situated just on the equator. Of these, however, only Sangai and Cotopaxi are in any state of activity, and they are seldom at rest. Pichincha and Tunguragua are, however, not quite extinct. The most dreaded of all is Cotopaxi, from which Mr. Whympster witnessed an eruption in 1880, in which the a h

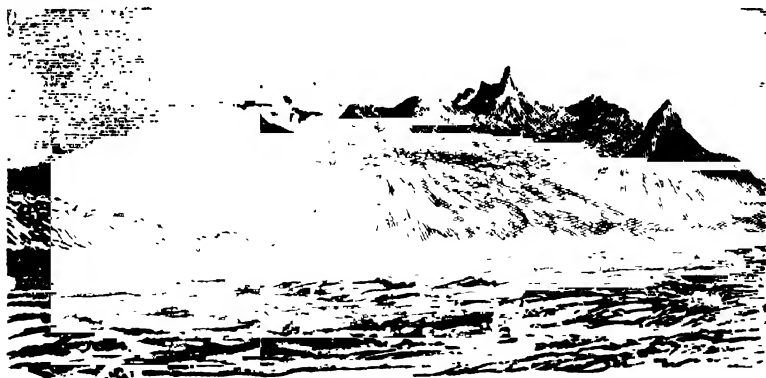


Cotopaxi.

rose in a column 20,000 feet above the rim of the crater, and spread over an area of many miles. He calculated that at least two million tons must have been ejected in this one eruption. In 1738 the flames rose nearly 3000 feet above the edge of the crater. In 1744 the sound of the explosions was so loud as to be heard at a distance of 550 miles. In 1768 the quantity of ashes thrown out was so great that in the towns of Huambato and Tacunga such

a degree of darkness was produced as to oblige the inhabitants to go about with lanterns for many hours in the day-time. The form of Cotopaxi is the most regular and beautiful of all the colossal summits of the Andes. It is a perfect cone, which, covered with an enormous bed of snow, shines with a dazzling lustre at sunset, against the deep blue of the sky.

A region so unrelieved by volcanic fires could not fail to



Pichincha.

be subject to repeated earthquakes; and accordingly no part of the world has suffered more from their dreadful effects. Sometimes the shocks come without giving any warning at all; in general, however, the inhabitants are forewarned of the approach of the convulsion. The whole of Chili is particularly subject to earthquakes. The city of Copiapo was entirely destroyed in the year 1819, not a house being left standing; and the city of Concepcion has been twice destroyed, viz. in 1780 and 1751. An earthquake of tremendous force occurred on the 19th November,

1822, which shook not only the whole of the low country of Chili, but was felt in the mountains, and even at Lima, Concepcion, Mendoza, and San Luis. Another took place on the 13th August, 1868, and was fearfully destructive in Peru and Ecuador. In the former country the town of Iquique, and the ports of Mejillones, Pisagua, Arica, and Chala were completely swept away. Arequipa, the second city in the republic, with 40,000 inhabitants, had no building left standing but the remains of its cathedral; Moquegua was also levelled; and at Mollendo and Ilo every

vestige of a habitation was destroyed. In the mining province of Huancavelica every city was destroyed, and the loss in that district alone was estimated at 300,000,000 dollars. In Ecuador, Ibarra, San Pablo, Atuntaqui, Imanatad, and other towns were rendered a mass of ruins; and in Ibarra, Otavala, and Cotacachi almost the entire population perished. Where Cotacachi previously stood is now a lake. Quito was very much injured, and many of the towns near it were almost entirely destroyed, and not less than 20,000 persons are supposed to have perished in that locality alone. The shock was felt for a distance exceeding a third of the whole length of the South American Andes, and the disturbed country was equal to a fourth of Europe. It is believed that at least 40,000 persons perished, and that more than 300,000 were deprived of food and shelter by the catastrophe.

Mineral Produce.—The Andes have been celebrated for their mines of metal since our earliest knowledge of America. Gold, silver, mercury, platina, copper, and tin are met with. Gold is found in the form of grains and small rounded lumps, scattered through alluvial soils, which have been derived from the disintegration of rocks containing the metal, and most probably in the form of slender veins.

Silver is more abundant in the Peruvian than in the Chilean Andes. The richest mines are those of Pasco, which have been worked since the year 1630. The mines of Chota are also very productive, the ore being found immediately beneath the surface. They are situated in the mountain of Gualgayoc, at an elevation of 13,300 feet, where the thermometer in summer descends every night to the freezing point. But the most celebrated are the silver mines of Potosi, in a lofty mountain, which has been perforated in all directions. It is said that there are not less than 5000 excavations in it, some of them within 120 feet of the top, which is 16,000 feet above the sea level.

Men of science and adventure from Europe had several times essayed to reach the summit of the Andes, but the attempt had always failed until 1880, when Mr. Edward Whymper, the hero of the Matterhorn, succeeded in reaching the crest of Chimborazo. Humboldt had only been able to reach to within 2000 feet of it. Altogether Mr. Whymper sojourned eighteen days on the slopes of the mountain. The cone of Cotopaxi, with its crater vomiting thousands of feet of flame, the great German philosopher and traveller pronounced inaccessible, but that of which he despaired Mr. Whymper accomplished, and passed twenty-six hours on the top. He encamped at an altitude of 19,500 feet, with the thermometer at 20° below zero, under a terrible wind and a hailstorm which covered the cone with a thick layer in a few minutes. The heat of the ground, however, was so great that the hail very speedily melted, and the india-rubber tent began to give way. Mr. Whymper also ascended several other peaks which had never before been scaled. He was absent from Quito forty-one days, during which he had six nights in bed, passed seven nights without any shelter whatever, and the remainder in tents at altitudes varying from 10,000 to 15,000 feet. He and his companions—two celebrated Swiss guides—were drenched every day, and everything became so hopelessly sodden that it was impossible to get themselves dry. On one mountain it rained for seventy hours without ceasing for a moment, and for more than six and a half days out of seven consecutive ones. The mountains were like saturated sponges, through the unceasing rains, and for days they waded through rather than walked over them. An interesting account of Mr. Whymper's ascent is given in the *Proceedings of the Royal Geographical Society* for August, 1881.

ANDORRA, a valley on the southern side of the central Pyrenees, lies between the department of Ariège, in France,

and the town of Urgel, in Catalonia, Spain. It is drained by the river Balira or Embellire, which falls into the Segre, a feeder of the Ebro. The territory is mountainous, but abounds in pastureage. Its forests, which formerly produced a quantity of timber, have been almost entirely destroyed for fuel. The mountains abound in bears, wolves, wild boars, goats, and game. The climate, though cold, is salubrious. Snow lies on the surrounding mountains during six months of the year, but in the lower parts fruits, potatoes, rye, and tobacco are grown. Cattle-rearing is, however, the chief occupation of the inhabitants. Smuggling is carried on with Spain and France.

Andorra is a semi-independent state, governed by a council of twenty-four, a syndic, who presides in the council, and by two viguiers, or magistrates, one of whom is appointed by the government of France and the other by the Bishop of Urgel. The territory was declared neutral by Charlemagne in 790, in return for services rendered to him by the inhabitants against the Spanish Arabs. Louis le Debonnaire gave the sovereignty of the valley to Sisebertus, the first bishop of Urgel, in 819, and from that time it has maintained its independence between France and Spain.

The valley is divided into six parishes, each of which sends four representatives to the council. The inhabitants, who are a simple and robust but ill-educated people, speak the Catalan language, and are Roman Catholics. They are strongly averse to all change, and their manners and customs have remained almost unaltered since the time of Charlemagne. There are no written laws, and judgment in criminal cases is final, although an appeal may be made in civil matters to the Court of Cassation at Paris, or the Episcopal Collegio at Urgel. The state possesses a complete military organization. It pays a tribute to the French government of 960 francs every year, in return for which certain imports are free from duty; and to the Bishop of Urgel, 891 francs.

The area of the whole territory is about 150 square miles, and the population, whose number is about 14,000, procure corn and other necessities by the produce of their trade in skins, wool, lead, and iron. Andorra, the capital, is situated on the river Balira, and contains 2000 inhabitants.

ANDOVER, a municipal and former parliamentary borough and market town in Hampshire, with a station on the South-western Railway, 67 miles from London, and 12 N.W. of Winchester. The town contains a church, dating from the time of William the Conqueror, but rebuilt in 1849, places of worship for dissenters, union workhouse, schools, and several almshouses. The town-hall is a handsome stone building, with a Grecian front. There is a trade in general agricultural produce, but the chief business of the town consists in malting. There is a large iron foundry in the neighbourhood. The extensive silk manufactures once carried on have now completely ceased. At Weyhill, a few miles distant, a fair is still held, which was formerly one of the most important in England. Andover derives its name from the Saxon *Andeasfaia*, which signifies the passage of the small river Ande or Anton. The Roman road from Winchester to Cirencester—which can still be traced—passed near Andover, and several Roman remains still exist. The corporation is said to date from the time of King John. In Edward the First's reign Andover sent two members to parliament, but from the time of Edward II. to that of Elizabeth it was unrepresented. The privilege being then resumed was continued until 1868, when one member was withdrawn, and the borough was finally deprived of direct representation by the Redistribution Bill of 1885. In 1881 the number of inhabitants was 5658. The town has direct railway communication with Southampton, Salisbury, and Basingstoke.

AN'DOVER, a town in Massachusetts, United States, 22 miles from Boston, on the south-west side of the Merrimac. It is intersected by several railways, and utilizes the water-power of its streams in the manufacture of woollens, linen, and thread. It is, however, chiefly renowned for its academic institutions, the principal of which are the Theological Seminary and the Phillips' Academy, which is well endowed. The first settlers came here in 1643 from Andover in England. Population, 5169.

ANDRÉ, JOHN, appears to have been a native of London, and to have been born in 1751. In 1769 he met at Buxton Miss Honora Sneyd, and the consequence was an immediate attachment, which became one of remarkable devotedness on his part, and which would seem to have been also returned by the lady. Her friends, however, interfered, and she was induced not only to discontinue her correspondence with André, but some years after to give her hand to another. Meanwhile André had become a clerk in a commercial house in London. But on receiving intelligence of Miss Sneyd's marriage to Mr. Lovell Edgeworth, he determined to quit both his profession and his country; and having procured a commission in the army, he proceeded with his regiment to North America, then the seat of war between Great Britain and her colonies. In this new field of enterprise his talents and accomplishments soon raised him to distinction, and he attained the rank of major, with the appointment of adjutant-general to the North American army. In the summer of 1780 Major André was with the troops which occupied the town of New York under the command of General Sir Henry Clinton, when the infamous Arnold, who had been intrusted by Washington with the important position of West Point, on the Hudson, about 60 miles above New York, sent over to the British commander his proposals for delivering that fortress into his hands—a scheme which, if it had succeeded, might not improbably have put an end to the war. On Arnold's overtures being accepted, André was appointed to conduct the negotiation with him. While executing this commission he was taken prisoner, and notwithstanding the exertions of General Clinton and others in his favour, he was executed as a spy at Tappan on the 2nd of October, 1780. A monument was erected to his memory at the public expense in Westminster Abbey.

This unfortunate officer was a person of cultivated mind and elegant accomplishments. He excelled in painting and music, and was also no despicable writer of verse. His humorous poem entitled the "Cow Chase," which appeared in three successive portions at New York in 1780, the last being published on the very day on which the author was taken prisoner, is a production of decided talent. It is in the style of Cowper's "John Gilpin," which celebrated poem was not written till some years later.

ANDRÉSBERG, a town of Prussia, in the celebrated mining district of the Upper Hartz, Hanover, stands at the southern foot of the Brocken, on a hill 1936 feet above the level of the sea. The neighbourhood is rich in mines, yielding silver, copper, iron, cobalt, and arsenic. The shaft of the Sampson silver mine is 2800 feet deep. Andrésberg is 10 miles from Clausthal, and although situated in such a lofty and bleak region it has of late years come into favour as a summer residence on account of its bracing mountain air.

ANDREOS'SY, COUNT, was born at Castelnaudary, in the province of Languedoc, in March, 1761. His family was of Italian descent. At the age of twenty he was made lieutenant of artillery. In the beginning of the French Revolution he shared in the general enthusiasm for the new order of things, and he afterwards served under Bonaparte in the early Italian campaigns and in Egypt, where he took a conspicuous part both in the military and the

scientific labours of that celebrated expedition. He was appointed a member of the Institute of Cairo, and wrote several memoirs, "On the Lake Menzaleh," "On the Valley of the Natron Lake," "On the Waterless River," &c. When Bonaparte returned secretly to France Andreos'sy was one of the few officers who accompanied him, and he ever after proved devoted to the fortunes of his great commander. After the peace of Amiens he was sent as ambassador to England. When Napoleon assumed the imperial crown, Andreos'sy was made inspector-general of artillery, and a count of the new empire. He went afterwards as ambassador to Vienna, and having quitted his post when the war broke out again between Austria and France in 1809, he was present in the campaign of that year, and was appointed governor of Vienna after the taking of that city. He was next sent as ambassador to the Ottoman Porte, in which important situation he won the general esteem of both Franks and Turks. After the abdication of Napoleon in 1814, Louis XVIII. recalled Andreos'sy from Constantinople, and sent him at the same time the cross of St. Louis. When Napoleon landed from Elba he appeared again on the political stage to assist his old master in his last struggle. After the battle of Waterloo he withdrew once more to private life, and busied himself in revising and publishing several interesting memoirs which he had written during his residence in Turkey. Andreos'sy died in 1828 at Montauban.

ANDREW, ST., one of the apostles, the brother of St. Peter. His father's name was Jonas. From the first chapter of St. John's Gospel he appears to have been one of the followers of John the Baptist, whom he left at the call of Jesus being the first disciple whom Christ is recorded to have received. According to St. Matthew and St. Mark, Jesus found Peter and Andrew together, following their occupation of fishermen, as he was walking by the Sea of Galilee, and called them, when they immediately left their nets and followed him; but this is supposed to have happened some time after the first interview recorded by St. John.

Very little indeed is recorded of St. Andrew in Scripture, but the ecclesiastical historians have professed to give accounts, in considerable detail, of the latter part of his life. According to Theodoret he employed himself for some years in journeying and preaching the faith throughout Greece; but Eusebius and other writers speak of Scythia as the province of his missionary labours. The common statement, however, is that he suffered martyrdom at Patrae, now Patras, in Achaia, having been crucified on a cross formed of beams obliquely placed, thus X, by the order of the pro-consul of that province. The cross of this pattern is named after the apostle. The festival of St. Andrew, who is the patron saint of Scotland, is held on the 30th November.

ANDREW, ST., or **THE THISTLE**, a Scottish order of knighthood named after the patron saint of Scotland, was instituted in 1540 by James V. It was discontinued after his death, but was revived by James II. of Great Britain in 1687, and was again re-established by Queen Anne in 1703. In the first instance the order consisted of the sovereign and twelve knights. By James II. the number was reduced to eight, but the original number was restored by Queen Anne, and it was further increased by George IV., who, by a statute passed in May, 1827, made it to consist of the sovereign and sixteen knights. The ornaments of the order are a collar of sixteen thistles intermingled with sprigs of rue, a gold medal, and a silver star made up of a St. Andrew's cross with rays, in the centre of which is a thistle of gold, surrounded by the motto of the order, "Nemo me impune lacessit." The letters K.T. are placed after the names of the knights.

ANDREW, ST., a Russian order founded in 1698 by

Peter the Great, and regarded as the highest in the empire. The collar is composed of St. Andrew's crosses and imperial crowns. The badge bears a cross enamelled in blue, with a figure of the saint, and on the reverse side an eagle, with the motto in Russian, "For religion and loyalty."

ANDREWS, LANCELOT, an eminent English prelate, born in London in 1555, was the son of a merchant of good repute. He received part of his education at Merchant Taylors' School, from which he was sent to Pembroke Hall, Cambridge, where he greatly distinguished himself. He was rapidly preferred in the church, and at the death of Queen Elizabeth was dean of Westminster. When James I. came to the throne, he immediately became a great favourite, and was consecrated bishop of Chichester in 1605. The king at the same time made him his lord almoner. He was subsequently translated, first to Ely, and then to Winchester. He died at Winchester House, in Southwark, on the 27th March, 1625. He was one of the authors of the translation of the Bible. The portions in which he was concerned were the Pentateuch, and the historical books from Judges to Kings inclusive.

Bishop Andrews was all his life a hard student, and is stated to have made himself conversant with all the learning of his age. Many eminent scholars of the time have all highly eulogized his extensive erudition, which was wont, it appears, to overflow in his conversation, as well as in his writings. He had, in addition to his learning and talents, the highest reputation for piety, hospitality, clarity, and munificence. One of Milton's early Latin poems is an elegy on the death of this distinguished prelate, in which he is bewailed in a strain of the most impassioned regret and admiration.

ANDREWS, ST., an ancient city and burgh of Scotland, on the coast of Fifeshire and on the bay of St. Andrews, 39 miles N.E. of Edinburgh, with which it is connected by the North British Railway. It stands on a peninsula, formed by the bay and the "burn of Kinness," a small stream which skirts the town on the S. and E. The harbour thus made is guarded by piers, and is capable of receiving vessels of 300 tons at spring tides; the navigation of the bay, however, is dangerous.

St. Andrews was formerly an opulent and commercial city. Since the Reformation, however, which first took root here in Scotland, it has gradually decayed; so that Dr. Johnson, who visited it in 1773, thus spoke of it:—"One of the streets is now lost; and in those that remain there is the silence and solitude of inactive indigence and gloomy depopulation." More recently, however, it has been undergoing a renovation, and the population has more than doubled since 1800. It is now established as a place of fashionable resort for bathing and playing the game of golf on the "links," or sandy downs by the sea; and houses are rapidly extending.

The parish church is a spacious structure, first erected in the year 1112, and rebuilt in 1798; it contains a monument to Archbishop Sharp, who was murdered near the town in 1679. There are several other places of worship, and a new Episcopal cathedral was built in 1867-70. A conspicuous and handsome modern building is the town-hall, which has a frontage of 120 feet. St. Andrews was made a royal burgh in 1140; the magistracy consists of a provost, a dean of guild, four bailies, and a treasurer. In 1471 the see of St. Andrews, which was founded by Angus, king of the Picts, was made into an archbishopric.

The University of St. Andrews, the most ancient in Scotland, was founded in the year 1411, by Henry Wardlaw, then bishop of St. Andrews. There are at St. Andrews the United College of St. Salvador and St. Leonard (formerly distinct), in which the several branches of general literature and science are taught, and St. Mary's College, which is appropriated to the study of divinity.

St. Salvador's College was founded in 1455, by James Kennedy, nephew of James I., and successor to Wardlaw in the see of St. Andrews, and was endowed with sufficient revenues for the maintenance of a principal, six fellows, and six poor scholars. The gothic chapel and tower, erected by Bishop Kennedy, are much admired. St. Leonard's College was founded in 1512 by Prior Hepburn, and endowed by him from the revenues of a hospital for pilgrims, from the funds of the parish of St. Leonards, and from property of his own. In 1747 it was found expedient to unite the two colleges. The joint establishment was accordingly transferred to St. Salvador's, and the buildings of St. Leonard's were sold, and converted into dwelling houses.

St. Mary's College was formed in 1587, out of the original seminary or "pædagogy," as it was called, of Bishop Wardlaw, by James Beaton, archbishop of St. Andrews; and his designs were further carried on by his successors, Cardinal Beaton and Archbishop Hamilton. In 1579 the college was remodelled under the direction of George Buchanan.

The curriculum or course of study in the arts extends over four sessions. These studies are pursued at the United College, and the session lasts from the end of October to the beginning of May. St. Mary's College has professors of divinity, church history, and Oriental languages, besides a principal, who also reads lectures on divinity. The education here is entirely theological. The study of mathematics forms a branch of instruction at St. Andrews. The government of the two colleges is quite distinct.

In each of the colleges are lodging-rooms for the students; and there are bursaries or endowments, entitling the holders to a certain income for so many years. Sixty belong to the United College, and seventeen to St. Mary's. The emoluments of the professors are from their salaries, and at the United College from fees in addition.

Besides class fees, the university and its colleges have a net revenue, after deducting public burdens, bursaries, &c., of about £3300 per annum. The university has little property distinct from that possessed by the colleges individually, except the library, which contains upwards of 40,000 volumes. The cost of the purchase of books is met by an allowance of £630 per annum, in lieu of the privilege of Stationers' Hall. The officer of highest dignity is the chancellor, but his office is merely honorary; the rector is the acting head. There is a museum in the United College buildings, belonging to the literary and philosophic society.

Dr. Bell, the founder of the Madras system of education, gave £15,000, 3 per cent. stock, for the establishment of a seminary in this his native city, to be called the Madras College. The average number of pupils is about 1000. The institution, which was founded in 1832, stands near the ruined chapel of the Black Friars, who, as well as the Grey Friars, formerly had a monastery here. The grammar school and commercial school have been incorporated with this college.

The antiquities of St. Andrews consist of the ruins of the chapel of St. Regulus, or St. Rule, the traditional founder of the city; the remains of the cathedral; and the ruined Church of St. Leonards, adjoining the college of that name. The ruined chapel and cathedral are surrounded by an extensive wall, erected by Prior Hepburn in the beginning of the sixteenth century, for the purpose of inclosing the grounds of the great priory of St. Andrews, which had been established about A.D. 1120. St. Rule's chapel, founded in the twelfth century, was long known as "the old cathedral." The true cathedral, founded in 1159, but not completed till 1818, was one of the largest and most magnificent in Scotland, and was, with several

other ecclesiastical buildings, nearly demolished in June, 1559, by a mob excited by a sermon of the celebrated John Knox. During the times of religious persecution Hamilton and Wishart suffered as martyrs, and a memorial to them has been erected in the town. On the shore of St. Andrews Bay, on a ridge or cliff, washed on the N. and E. by the sea, are the ruins of the castle, which serve as a landmark to seamen. It was erected by Roger, bishop of St. Andrews, about the year 1200, and was the birthplace of James III. in 1445, as well as the scene of the assassination of Cardinal Beaton in 1546.

The town, conjointly with Cupar, Easter and Wester Anstruther, Crail, Kilrenny, and Pittenweem, sends one member to Parliament. In the Scotch Reform Bill of 1868 a representative was given to the united universities of Edinburgh and St. Andrews. The population of the parliamentary burgh of St. Andrews in 1881 was 6452.

ANDRIA, a town of Southern Italy, in the province of Terra di Bari, 31 miles W. of the town of Bari. It stands in a plain, and derives its name from the numerous caves (*antra*) in the neighbourhood. It possesses a fine cathedral, founded in 1046, and carries on a trade in almonds, which are imported in large quantities from the surrounding country. There are no manufactures of importance. It was once a favourite residence of the Emperor Frederick II., two of whose wives were interred here. In 1799 it underwent a siege, and after a brave resistance was burned by the French general Broussier. The population in 1882 was 37,471.

ANDROCLUS, a runaway Roman slave, who when recaptured was cast to the lions in the circus. The lion let loose at him, instead of tearing him to pieces, fawned on him caressingly, licking him like a dog. It then transpired that Androclus had cured the lion of a hurt, a thorn in his paw, and that the grateful beast had shared his cave with him until his recapture. By public acclamation Androclus was presented with the lion and set at liberty.

ANDRŒCIUM, in botany, includes the male parts of a flower (the stamens) taken collectively.

ANDROMACHE, the wife of HECTOR. Homer represents her as a type of a heroic wife and affectionate mother. Andromache is the noblest female character in the *Iliad*. Euripides does not do her justice in his play bearing her name.

ANDROMEDA, a beautiful heroine of the Greek mythology. Perseus, flying through the air on his return from slaying the gorgon Medusa, saw the maiden chained to a rock in mid ocean, and deserted. Her parents, Cepheus and Cassiopeia, rulers of Ethiopia, had left her a prey to the sea monster which ravaged their coasts, terribly avenging a slighting comparison they had drawn between the beauty of the Nereids (sea-goddesses) and that of Andromeda. Only thus, decreed the oracle of Ammon, could the anger of Poseidon (Neptune) be appeased.

Perseus released the maiden from her chains, waited for the monster, slew him, and turned him into stone with the gorgon's head which he was carrying to Athena. Perseus claimed the beautiful girl as his bride; and by help of the gorgon's head, which turned his antagonists to stone, was able to carry her off from a powerful rival and his followers.

The four constellations to which the names of these personages were given by the ancients are easily found, north of the ecliptic. Cassiopeia's chair is roughly as far on one side of the Pole star as the Great Bear is on the other; Cepheus is between her and the Pole; Andromeda is on the other side of her to Cepheus; and Perseus extends in a graceful waving line from Andromeda to the Pleiads in Taurus.

ANDRONICUS, the name of three of the Byzantine emperors. Andronicus I., a grandson of Alexis I., was born in 1110, and died in 1185. In his youth, while

following the retreat of the Byzantine army, he was taken prisoner by the Turks. On his release he lived for a time at Constantinople, at the court of his cousin, the Emperor Manuel, whose niece became his mistress. He received a military command in Cilicia, but having entered into a treasonable correspondence with the King of Hungary, he was arrested and confined in a tower of the palace, where he remained twelve years. He contrived to escape, and after several romantic adventures arrived at Kiev, in Russia, where he won the favour of the Grand-duke Jaroslav. Andronicus, in his exile at Kiev, became instrumental in forming an alliance between the Russian prince and the Emperor Manuel, and thus obtained his pardon from the latter. He led a body of Russian cavalry from the banks of the Borysthene to the Danube, and assisted the emperor against the Hungarians at the siege of Semlin. By his dissolute conduct and his intrigues he at length excited the anger of the emperor, and was banished to Oenoe, a town of Pontus, on the coast of the Euxine, between Cape Heraclium and Cape Jasonium, where he remained till the death of Manuel, in 1180. The disorders of a disputed succession induced the patriarch and the principal patricians to recall Andronicus, as the only man who could restore peace to the empire. He arrived in the capital in the midst of acclamations, acknowledged the young Alexis, son of Manuel, as emperor, and was associated with him in the empire as colleague and guardian. He then developed his ambitious views. He first caused the empress-mother to be tried on a false charge of treasonable correspondence. She was condemned unheard, strangled, and her body thrown into the sea. He next murdered young Alexis himself, and then assumed the undivided authority as emperor in 1183. He married Agnes, Alexis' widow, who was still almost a child. She was sister to Philippe Auguste of France. "Andronicus' short reign," says Gibbon, "exhibited a singular contrast of vice and virtue: when he listened to his passions he was the scourge, when he consulted his reason the father of his people." Individuals and towns, for the gratification of his revenge, were treated with the greatest barbarity. At last so many terrors drove the people of Constantinople to revolt; Isaac Angelus, one of the proscribed, and a descendant in the female line from Alexis I., took refuge in the Church of St. Sophia. A crowd assembled and proclaimed him emperor. Andronicus was then, with his young wife, in one of the islands of the Propontis; he rushed to Constantinople, but was overpowered, taken prisoner, and dragged to the presence of Isaac Angelus, who, without any form of trial, gave him up to the personal revenge of his enemies. Though he was now over seventy years of age, the infuriated populace inflicted upon him the most frightful tortures, and finally put him to death on the 12th September, 1185.

ANDRONICUS II., the son of Michael Paleologus, was born in 1258, became associated with his father in the empire in 1273, and sole emperor in 1282. His reign was marked by weakness and disaster, and he was finally deposed and compelled to retire to a monastery in 1328, by his grandson Andronicus III., who succeeded him. The latter was born in 1295, and died in 1341. During these two reigns the Turks made great progress, and conquered and occupied many of the provinces of the empire.

ANDROPOGON is a genus of Gramineæ (GRASSES) found in tropical countries. *Andropogon Schænanthus* is the fragrant lemon grass which is grown in our conservatories. The leaves are used in India as a tonic, and the essential oil extracted from it is used by perfumers under the name "oil of Verbena;" it is also used as a liniment for rheumatism. The roots of *Andropogon muricatus* are used in India (where it is called "khus") to make covers for palanquins, and screens, "which when wetted diffuse

an agreeable odour and coolness." It is probable that the "sweet cane," the "calamus," and the "rich aromatic reed from a far country" of Scripture refer to a species of *Andropogon*, perhaps to *Andropogon lanigerum*, common in Arabia, which at any rate answers to the description of the *αρωματικός* or "aromatic rush" of the Greeks.

AN'DROS or **AN'DRO**, an island of the Grecian Archipelago, lying S.E. of Eubœa or Negropont, from which it is distant 6 miles. It forms the most northerly of the Cyclades group, is 25 miles long by 8 broad, and has a population of 16,000. The island is mountainous, and the highest summits retain the snow during many months in the year. The soil is very fertile, and produces excellent grapes, lemons, oranges, and pomegranates. Near the ruins of the ancient Andros a famous temple to Bacchus once stood. Silk is exported. The supply of corn is chiefly imported from the island of Eubœa. The town of Andros or Castro, on the eastern coast, which contains about 5000 inhabitants, is the capital, and besides its silk manufactures produces carpets. It has a small harbour, but the best in the island is at Gaurio (*Gaurium*) on the western side. There are besides more than sixty villages scattered over the island. Andros was colonized by the Ionians 1000 years B.C., and soon rose to importance; it now forms, with Tenos, a government of the kingdom of Greece.

ANDU'JAR, a town of Spain, in the province of Jaen, Andalusia, 10 miles E.N.E. of Cordova, on the right bank of the Guadalquivir, and at the foot of the Sierra Morena. Its ancient name was *Forum Julium*. The river is crossed by an old dilapidated bridge, the road to which is lined with fine trees. The town is unhealthy, but the soil in the neighbourhood is very fertile, and produces wheat, barley, oil, wine, honey, and fruit. There is also some trade in cattle. The inhabitants amount to about 15,000, and are principally employed in agriculture; but there are also some tanneries, soaperies, and potteries. In the potteries are made the noted alcarrazas, or porous cooling vessels of clay, for which the town is famous all over Spain. The convention of Baylen was signed here in 1808.

AN'DUZE, a town of France, in the department of Gard, about 6 miles S.W. of Alais, stands on the right bank of the Gardon-d'Anduze, between precipitous rocks on the one side, and hills covered with vines and olives on the other. It is an ill-built place, but the environs present some enchanting scenery. The Terrace, which serves as a dyke against the inundations of the Gardon, and from the middle of which springs a cut stone bridge across the river, deserves mention. The population amounts to 5000, who manufacture silk, livery, silk hats, cloth, pottery, glue, and leather, and trade in cattle, raw and thrown silk, and corn. Many of the inhabitants are Protestants.

ANEGA DA, the most northerly of the Lesser Antilles, the West Indies, is a small low-lying island of coral formation, belonging to Great Britain. It has an area of 13 square miles, and a population of about 300.

ANEMOMETER (from the Greek, signifying "wind-measurer") is an instrument for ascertaining the force of the wind, generally by finding the mechanical effect which it produces on the apparatus. The first anemometer was invented by Wolf, and is described by him in his "Elementa Mathematica," vol. ii. p. 319 (Geneva, 1746). It consists of four small sails, like those of a wind-mill, which turn on a horizontal axis; this axis is connected by wheel-work with another in which is inserted one end of a bar carrying a weight. The wind acting upon the sails causes this bar to turn in a vertical plane; and, when it is in such a position that the weight on it counterbalances

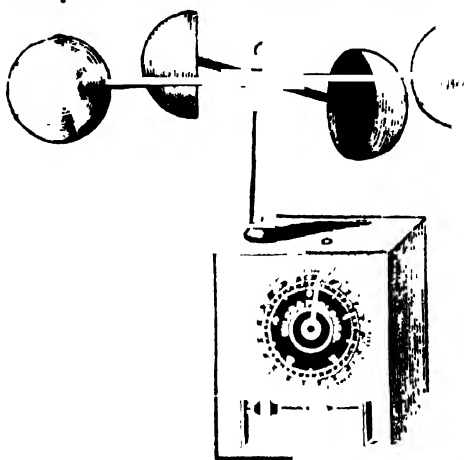
the pressure of the wind, the angle which it makes with a vertical line passing through the axis affords a measure of the wind's force.

Professor Leslie having found that the cooling power of wind is proportional to its velocity, determined that velocity from the formula—

$$V = 1 - \frac{\theta T}{2 t}$$

by means of a spirit-of-wine thermometer. In this formula *V* is the velocity of the wind in miles per hour, *T* is the time in which the top of the alcohol in the tube descends through half the number of degrees to which, by the application of heat, it has been raised above the degree at which it previously stood; and *t* is the time in which the top of the alcohol, when exposed to the action of the wind and raised as before, descends through an equal number of degrees.

Casella's anemometer has attracted much attention since it was used by the Royal Irish Academy, in a series of tidal and meteorological observations on the Irish coasts. This instrument was invented by Dr. Robinson of Armagh, and has been modified and improved by Mr. Casella. It is more trustworthy than any of the other anemometers now in use. It consists essentially of four hemispherical cups, as shown in the figure, having their diametral planes exposed to a passing current of air; they are carried by four folding horizontal arms attached to a vertical shaft or axis, which is caused to rotate by the velocity of the wind. Dr. Robinson found that the cups,



Casella's Anemometer.

and consequently the axis to which they are attached, revolve with one-third the wind's velocity. A simple arrangement of wheels and screws is appended to the instrument, which, by means of two indices, shows on inspection the space traversed by the wind. The outer or front wheel, one revolution of which is equal to the transit of 5 miles of wind, is furnished with two graduated circles, the interior being divided to the eighth part of a mile, so that each division is equal to a furlong, while the exterior is divided into 100 parts, each being equal to 5 miles. The stationary index at the top of the dial marks the number of miles (under five) and furlongs that the wind may have traversed, in addition to the miles shown by the traversing index, which revolves with the dial and indicates the transit of every 5 miles. The graduation is to 500.

A new form of anemometer has been invented by Mr. J. E. B. Gordon. It consists of a pair of fans and a set of revolving cups, fixed in any convenient place, and connected by insulated wires with a galvanic battery and with a recording apparatus, composed of a clock, a wind-dial (showing the direction of the wind), a reel of paper, and an endless band carrying a carbon paste for printing. The printing band marks every quarter of an hour of time on the left-hand margin of the slip of paper issued by the machine, the direction of the wind on its right-hand margin, and records a dot for every mile the wind has traversed on a central line, so arranged as to be comparable with the time record. The great advantage of the instrument is in the character of its records, and in the fact that the electrical communication does away with the use of cranks and shafting, which are costly and heavy, and render it necessary that the recording instrument should be close to the fans.

Another instrument, invented by Osler, consists of a brass plate attached to a vane which is maintained at right angles to the wind, and by means of a combination of springs and a pencil attached, marks the distance it is moved backward on a sheet of paper made to pass under it by means of clockwork. A second pencil in connection with the vane records the changes in the direction of the wind, and a third connected with a rain gauge indicates the quantity of rain that has fallen.

For a table of the force of winds, see AERO-DYNAMICS.

ANEMONE is a genus of plants belonging to the RANUNCULACEÆ. The sepals are five or more in number, imbricated, and are coloured to supply the place of a corolla; in anemones grown in gardens some of the numerous stamens are often converted into petals, and this metamorphosis is sometimes found even in wild flowers. Below the calyx there is almost always a whorl of leaves, forming an involucre; in the native wood anemone (*Anemone nemorosa*) they are like the ordinary leaves, and are placed at some little distance below the flower; in *Anemone Hepatica* they are close to the flower, and look like a calyx. The fruit is composed of numerous achenes, either woolly, as in the garden anemone (*Anemone coronaria*), or terminated by long feathery tails, as in the pasque flower (*Anemone Pulsatilla*).

ANEMONE, SEA, is the common name of the order Malacostrata, which belongs to the class ARTHROPODA of the subkingdom COLEENTERATA. In these animals the body is regular, flower-shaped, more or less elongated, and very contractile. The mouth, the hole at the top, leads into a tube open at the bottom and leading into the general body-cavity. This tube is closed by a sphincter muscle at the base, and only opens for the passage of the digested fluid to supply the general wants of the body. In most species the base of the body acts as a sucker by means of which they adhere to rocks, stones, &c., while the opposite extremity presents a disc with a central orifice; this is surrounded by tubular tentacles, either in a single row or in several rows, capable of being moved in various directions, elongated or contracted; they are in fact the arms by which the voracious animal seizes its prey and drags it to the mouth. When waiting for its victim, some mollusc or unfortunate little crab, these arms are expanded like the petals of a flower, and being tinted with brilliant colours present an elegant appearance. The Actinia seizes animals with which it might appear incapable of contending, and engulfs them, distending itself to a great degree; but digestion is very rapid, and the shells and harder parts of the victims are disgorged when the soft parts are consumed. The sensibility of these creatures is extreme; they contract even when a dark cloud passes over them; and certain species which live in the sand of the shore (*Actinia senilis* and *coriacea*) will disgorge water and rapidly bury them-

selves on the approach of footsteps; yet such is their tenacity of life and their vital energy that when cut transversely asunder each part will become a perfect and distinct individual. The tubular tentacles have each an orifice at the extremity, and they communicate with a compartment between the stomach and muscular tunic, partially divided by vertical laminæ. In these chambers are the eggs, arranged in clusters on a delicate membrane; the young escape into the stomach and are expelled by the mouth. On our coasts the Actinia may be seen at low water clustered upon rocks and masses of stone, which they cover as if with flowers; there they tenaciously adhere by their base, but are nevertheless capable of moving from one spot to another, and in winter they seek deeper water where the changes of temperature do not affect them; it is during the summer consequently that they are chiefly to be observed. On our southern shores the purple sea anemone (*Actinia equina*) is very common; and two species, the *Actinia coriacea* and *Actinia senilis*, tenant the sands, in which, when alarmed, they bury themselves with great promptitude. One species on the Mediterranean (*Actinia Jordaica*) is esteemed a delicacy by the Italians. *Actinia sol* is the best known species. Various species are figured in the Plate. F. Day mentions having found small fish (Amphiprion) actually living inside an anemone. While he was engaged investigating fish in the Andaman Islands, one of the natives took him to an actinia, detached it from the rock, and shook out two small fish. This was done twelve times afterwards, and in each case two fish fell out, except once when three appeared. His friend Captain Hamilton dug out one of these anemones in North Bay, dragged it to shore, and turned out three fish. These he replaced in the sea, and they seemed not to know what to do, swimming round and round as if in search of something. He then put back the anemone into the sea, and the fish immediately followed it as he drew it back to its original habitat.

Geddes has demonstrated the presence in anemones of algæ, low members of the vegetable kingdom. These minute plants, consisting of single cells, exist in large numbers in the outer layer of the skin of an anemone, known as *Anthea cereus*, supplying them, under the influence of sunlight, with abundance of oxygen and starch, removing their waste products of nitrogen and carbonic acid, and forming on their death a wholesome and easily digestible meal. The anemones, on the other hand, provide a matchless dwelling for the algæ, so transparent that the rays of the sun can freely penetrate, enabling them to digest the food provided at their very doors in the shape of the carbonic acid and nitrogenous waste given off by the anemones.

ANEMOPHILOUS (ἀνemos, wind; φίλος, loving) plants are those in which the wind carries the pollen from flower to flower. It has been proved that if flowers are fertilized by pollen from another plant, they produce seedlings which are much finer than if fertilized by their own pollen; "all experimenters have been struck with the wonderful vigour, height, size, tenacity of life, precocity, and hardness of their hybrid productions" (Darwin's "Animals and Plants under Domestication," ch. xvii.) This cross-fertilization is effected either by wind or insects; if by insects, the plants are called *entomophilous*. Amongst anemophilous plants may be mentioned the fir and other conifers, poplar, willow, birch, hop, wheat, and other grasses. The flowers are neither gaily coloured nor do they secrete honey, to attract insects. The stamens are long, and the pollen easily detached; while the stigmas are branched or hairy, thus more readily catching the wind-borne pollen. These plants generally flower in the spring, before the appearance of the leaves, which would prevent the pollen from reaching the flowers.

ANÆROID BAROMETER. See BAROMETER.

ANÆURISM is a Greek word (*aneurismos*), literally signifying "a widening or extension." It is now used to signify a tumour, consisting of a preternatural enlargement of an artery.

An artery is composed of three coats, which in its healthy state yield only to a certain extent to the impulse of the blood, so that the tube possesses only a certain diameter; but in a state of disease the impulse of the blood distends these coats or tunics to a preternatural extent, causing that part of the artery to swell out into a tumour or bag. The distension of the coats of the artery progressively increasing, they are at last capable of no further stretching, and consequently are torn asunder and burst. But the inner and middle coats of the artery are not so elastic as the external coat; the two former coats are therefore ruptured a considerable time before the latter gives way, in which case the only proper coat of the artery forming the wall of the aneurismal tumour is the external. This coat in its turn, getting thinner and thinner as the dilatation goes on, at length bursts like the former; the blood escapes, and life is suddenly extinguished. But sometimes the tumour does not immediately burst even after the rupture of the external coat of the artery; for there is placed around the artery a dense and strong membranous sheath of cellular membrane, which sheath is far more elastic than any of the coats of the artery; and it is found that sometimes the aneurismal sac, or the bag-like tumour which the dilated artery forms, consists only of this condensed cellular membrane, all the proper coats of the artery having been destroyed.

The cure of aneurism is effected by cutting down upon the artery, and passing a ligature around it above its dilatation. The immediate effect of the ligature, of course, is to stop the flow of blood into the sac; its ultimate effect is to excite inflammation in the coats of the vessel, by which its sides, brought into close contact by the ligature, permanently adhere together, thus inducing an obliteration of the cavity of the vessel. The circulation being carried on by collateral means, the blood finds its way by the smaller branches of the artery to the parts beyond the ligature. Other modes of surgical treatment consist of the compression of the aneurism by means of the tourniquet, pressure of the fingers, flexure of the limb, galvanopuncture, and the injection of fluids which coagulate the blood. Internal aneurisms are treated by medical means, and consist in moderating the action of the heart by rest, and the administration of suitable medicines, such as digitalis and iodide of potassium.

ANGEL, a piece of money anciently coined and impressed with an angel. The angel was originally a gold piece of France, where it was first coined in 1340; it was always of fine gold, but not always of the same weight. It appears to have been introduced, with its minor divisions, the half angel and the quarter angel, into England by Edward IV., in 1465, and was continued as a coin by King Henry VI. when he returned to the throne. When first introduced the angel was valued at 6s. 8d., and being of the same value as the noble, was sometimes called the noble angel. In the latter part of Henry VIII.'s reign its value was raised to 8s.; in Mary's reign to 10s., which value continued to the end of the reign of Charles I., who was the last English sovereign who coined the angel. The device on the obverse of the angel was the figure of St. Michael standing upon a dragon, and piercing him through the mouth with a spear. An excellent specimen of an angel of Edward IV. will be found under COINS.

ANGEL-FISH, or Monk-fish (*Rhina squatina*), belongs to the family of SHARKS, though in form and habits it comes near the rays. It attains a length of 5 feet; the body is broad and flat. The mouth is large, situated at

the extremity of the snout, with numerous pointed, conical teeth. The eyes are small, on the top of the head; and behind them are the wide spout-holes. The gill-openings are five in number, wide, and placed on the sides of the body; there are no gill-covers, but the gills are partially covered by the base of the pectoral fins. The skin, as in all the sharks, has no scales, but is covered with bony warts. There are two dorsal fins on the tail, and no anal fin. The name *angel-fish* is said to have been given to the fish on account of the appearance of the pectoral fins, which are widely expanded, like wings, on each side. The ventral fins are on the abdomen, and are also wide-spread. The skeleton is not bony, but cartilaginous. The tail, unlike most of the shark family, is composed of two nearly equal lobes, proceeding from the end of the spine. The young are brought forth alive, about twenty at a birth. The angel-fish swims close to the bottom, feeding on small flat-fish. It is common all over the world, in the tropics and the temperate zone. The skin was used by the ancient Greeks, like shagreen, for polishing wood and marble; and the name *Rhina* is their *rhinë*, which also means a rasp or file.

ANGELICA, a genus of plants belonging to the order UMBELLIFERÆ. The name was given in olden times from its supposed *angelic* virtues as an antidote against poison, plague, and witchcraft, but it is not considered important in modern pharmacy. *Angelica sylvestris*, the British species, is found in wet places; it is a tall plant, growing 5 or 6 feet high, and the leaf-stalks have large egg-shaped sheaths for the flowers while still in bud.

Angelica is also a garden name for a species of another genus, *Archangelica officinalis*, which is much cultivated on the Continent for the sake of its agreeable aromatic odour. Its blanched stems, candied with sugar, form a very agreeable sweetmeat, possessing tonic and stomachic qualities. Its roots contain a pungent, aromatic, stimulating principle, which has caused them to be employed in scrofulous diseases. They have been administered in the form of infusion and of powder, as diuretics and sudorifics; but in this country they are no longer employed as curative agents.

ANGELS. This word, in both the Hebrew and Greek languages, signifies messengers, and though sometimes applied to men, is more generally used to designate a class of superior spirits, and thus used denotes the office sustained by them as agents of Divine Providence. There are numerous references to these beings both in the Old and New Testaments, but there is very little direct teaching upon the subject, and they are spoken of rather incidentally, their nature and character being never exactly defined. It was always maintained by the Jews that the origin of the angels was distinct from and antecedent to that of man, and this has been almost universally accepted by the Christian Church, though the theory that they are the spirits of men was maintained in the early church by Dionysius the Areopagite, and in later times by Emanuel Swedenborg. In the days of the Schoolmen the nature of the angels, being a point upon which it was impossible to arrive at any definite conclusion, formed a staple subject of discussion; but beyond the decision of the second Synod of Nice, in 787, which assigned them an ethereal or fire-like body, and the Lateran Council of 1215, which declared their immateriality, the views of the church have never been authoritatively defined. The belief in guardian angels was held both by heathens and Jews, and was early adopted by the Christian Church, and the custom of invoking and worshipping them soon became very general. It was opposed by some of the fathers, but it was maintained by others, and in the Greek and Roman Churches it is generally practised at the present day.

Thus in the Catechism of Paris it is expressly declared that to each person is assigned a guardian angel, who prays for him, offers to God his good actions, defends him against the devil, and guards him in danger. It is also asserted "that we must feel grateful for the care which he takes of our salvation; we must invoke him with confidence in the hour of danger, we must have a profound respect for him, and fear to displease him." The doctrine is also very beautifully expressed in the well-known poem, by Cardinal Newman, entitled "The Dream of Gerontius." That which may be entitled the converse of this belief, or the theory of the existence of evil angels who are at enmity with God, and who exert an evil influence upon men, is also of very early origin. It is difficult to say when the idea first arose among the Jews, though modern scholars have endeavoured to trace its origin and development. It pervaded the whole system of Jewish thought at the time of Christ, and was adopted by the apostles and founders of the church. There are many references to the fallen angels in the New Testament, but their origin, nature, and the extent of their influence are, as in the case of the good angels, left undefined.

ANGELICO, FRA (Giovanni Guido), called also Da Mugella, from the place of his birth, and Da Fiesole, from his principal residence. He is scarcely known by his own name of Giovanni Guido. He was born in 1381, and was taught painting by his elder brother, Fra Benedetto. He joined the Predicants at Fiesole, near Florence, in 1407; in 1409 he left Fiesole, and settled in Cortona as a fresco painter, but in nine years returned to Fiesole, and remained there until he was invited to Florence, in 1436, to decorate the new convent of St. Mark, then given to the Predicants. In this convent are not only the greatest works of Fra Angelico, but also some exquisite illuminated missals, &c., of Fra Benedetto. In 1445 he was invited to Rome by Pope Eugenius IV., for whom he executed some works in the Vatican. He also painted a chapel there for that pope's successor, Nicolas V. He died in Rome in 1455. The most characteristic works of Fra Angelico are those in the Convent of St. Mark, illustrating the passion of Christ, some of which are still in a good state of preservation; and there are many admirable small specimens preserved in the Academy of Florence. The works of Fra Angelico are conspicuous for their sentiment and expression of piety. They are exclusively religious or ecclesiastical; and their piety is so palpable and genuine that they became in a great measure the type of character for religious art during his own and subsequent generations. The sincerity of his sentiment was justified by the simplicity of his life. His character was so high that Nicolas V. offered him the archbishopric of Florence, but he declined the dignity on the plea that to govern or lead were alike incompatible with his nature. Though not canonized, Fra Angelico is a "Beato," which is a solemn distinction conferred by the church for eminent piety, second only to canonization.

ANGELO BUONAROTTI, MICHAEL. See MICHAEL ANGELO.

ANGER. Aristotle points out in his "Rhetoric" (ii. 2) that the essential feature of anger is the desire to do some injustice or injury to the person who has caused the pain. Butler ("Sermon upon Resentment") maintains that, besides the deliberate malice, anger is often raised without even any appearance of injury as distinct from hurt or pain. "The real demerit," says Butler, "or fault of him who offers that violence which naturally excites anger, or is the cause of opposition or hurt, does not in many cases so much as come into thought." There is therefore an anger which necessarily arises, and is distinct from the anger, whether hasty or deliberate, which is occasioned by injury or contempt. The reason and end of the instinctive

passion of anger is considered by Butler to be, that we should be better qualified to resist and defeat sudden force, violence, and opposition, simply as such, and considered without regard to the fault or demerit of him who is the author of them. Professor Bain, in his work "The Emotions and the Will," analyses the *irascible emotion* into its constituent elements, showing that it involves as its basis a feeling of pleasure. He agrees with Aristotle that the unmistakable fact of anger is the desire to put some one to pain; the emotion can only be felt towards an inanimate object when personified. He maintains that to be roused by injury to resist, and even to disable the person who has offered the violence, is not anger, but volition. "Under the angry feeling we proceed further, and inflict pain upon the author of the injury, knowing it to be such, and deriving satisfaction in proportion to the certainty and the amount of the pain. This positive pleasure of malevolence is the fact to be resolved." A shock of pain, caused by some person, is followed by strong excitement of the nervous system; and this excitement, diffused over the body, rouses the active organs to such a degree that something must be done, some effect produced in order to work it off. It is only after a man has acquired the habit of repressing the outburst of activity that he is able to appear calm, even when actually angry; and this very repression of the physical manifestation is of great consequence in overcoming the malevolent feeling. Connected with the bodily activity is a derangement of the organic (e.g. digestive) organs, caused by the withdrawal of blood and nervous power. In the ultimate analysis of anger, three elements may be noted—1. The sight of suffering, in the absence of sympathy, is a "sensual and sensual stimulation; the "Roman holiday" at the Circus, the Spanish bull-fights, the English bull-baiting and cock-fighting, go to prove this fact. 2. There is a sense of superiority aroused at the exhibition of weakness in another, and the pleasurable emotion of *power* is especially strong when it follows immediately upon suffering on our own part. 3. There is a pleasurable feeling of relief when a man finds his enemy fearful, or rendered unable to injure him further.

ANG'ERBURG, one of the circles of the government of Gumbinnen, in the province of Eastern Prussia, with about 30,000 inhabitants. Angerburg is also the name of a small town, with a castle, lying on the Gross-Mauer Lake, in this province. It has some woollen manufactures. Population, 4000.

ANG'ERMANLAND or **ANGERMANNIA**, an old province of Sweden, now included in the province of West Norrland, which is traversed by the Angermann, a navigable river flowing into the Gulf of Bothnia.

ANG'ERMUNDE, a circle in the Prussian province of Brandenburg. It is also the name of the capital of the circle, 43 miles from Berlin, and standing on the shore of the Lake of Munde. The inhabitants, who number 5000, are engaged in the manufacture of cloth and hosiery.

ANGERS, a town in France, in the department of Maine-et-Loire, of which it is the capital, as it once was of the province of Anjou. It stands on the banks of the Mayenne, between the points of its junction with the Sarthe and the Loire, 161 miles S.W. of Paris. It is the Roman *Juliomagus* or *Andagaram*. In the ancient parts of the town the streets are narrow, and many of the houses are built of wood, though in some the wood is concealed by a thin covering of slate. The more modern quarters are regularly and well built. The old ramparts of the town are now replaced by boulevards planted with trees. Among the principal edifices are the castle, the cathedral, and the Hôtel Dieu, built by Henry II. of England. The castle, on a steep rock, at the base of which the Mayenne flows, has walls of great height and thickness, flanked by eighteen

massive circular towers, the work of early ages; the chapel and palace within the castle, built by René of Anjou in the fifteenth century, are of much later date than the rest of the building. Near the castle is a statue of King René of Anjou, in bronze, by David. The cathedral, dedicated to St. Maurice, is a grand building of the ninth century, in the Roman Basilica style. It stands on an eminence in the centre of the town, and has two lofty spires. The architecture of the interior exhibits exquisite work, and there are fine painted glass windows and tapestry of great antiquity. The tombs which it contained were destroyed at the Revolution.

Angers is the see of a bishop, and the seat of a high court. There are also in the town a school of medicine, a school for deaf mutes, a public library which contains 40,000 volumes, a museum of natural history, a fine collection of French paintings and sculptures, a botanic garden, and a school of arts. Angers formerly possessed a university, founded in 1246, as well as a military college—since removed to Saumur—in which Lord Chatham and the Duke of Wellington were students. The town has given birth to Bernier the traveller and David the sculptor.

Angers occupies an important position near the mouth of three navigable rivers. The manufactures consist of sail-cloth, camblet, serge, handkerchiefs, hosiery, &c.; and there are establishments for bleaching wax and refining sugar. Besides the articles from their own factories, the inhabitants carry on a trade in the agricultural produce of the surrounding district, corn, wine and brandy, flax, hemp, wax, honey, and dried fruits. The neighbourhood is famous for its nursery gardens and its extensive slate-quarries. Steamers ply daily from Angers to Nantes, Tours, and Orleans. The population of the town in 1882 was 57,000.

ANGINA PECTORIS, or "the suffocative breast-pain," is the name given to a severe paroxysmal pain in the chest about the region of the heart, which is accompanied with an intense fear of impending death. The pulse during the attack is usually slow and feeble, the breathing short and hurried, the body becomes covered with a cold sweat, and the sufferer feels that if it is continued it must result in sudden death. It seldom lasts more than a few minutes, and during the intervals the subject of the disease may enjoy ordinary health, but is always liable to an attack; and though persons suffering from this complaint often live many years, death may occur with great suddenness at any time. It is more common in men than women, is unknown in infancy and childhood, and very seldom occurs before the age of fifty. Those most subject to it appear to be elderly persons in easy circumstances, and it seldom appears among the poor. The remedy which has been found most successful in the treatment of this disease is the nitrate of amyl used as an inhalation during the attack. It causes almost immediate cessation of the pain, and its continued use in this way lessens the frequency and the severity of the attacks so as to greatly promote recovery from the disease. Another medicine used consists of small doses of nitro-glycerine made up in the form of a mixture or lozenge, and taken at the commencement of the attack.

Persons suffering from this complaint should avoid excitement of all kinds, keep a strict command of temper—as the indulgence in a burst of passion may bring about instant death—and observe great temperance in everything—food, drink, work, or exercise.

The origin and nature of this disease are but imperfectly understood. It is generally regarded as symptomatic of some defect in the vascular or nervous supply of the heart, or of fatty disease of the wall of the same organ; but in many cases where death has occurred during an attack, the post-mortem examination has discovered the heart to be in a normal and apparently healthy state.

ANGIOCARPOUS LICHENS are those in which the receptacles (*apothecia*) of the spores are immersed in the substance of the lichen, allowing the spores to escape by a small pore.

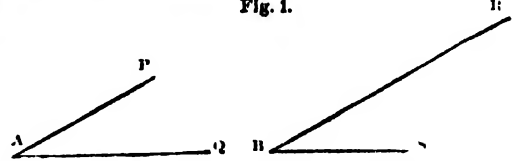
ANGIOSPERM (Gr. *aggeion*, a receptacle; and *sperma*, seed). All flowering plants, PHANEROGAMS, are divided into two groups, Gymnosperms and Angiosperms. The respective names point to one important difference between these groups: in Angiosperms the ovules or young seeds are inclosed in a receptacle which is called the Ovary, and in Gymnosperms this receptacle is wanting. In Angiosperms also the *endosperm* (the food for the embryo) only develops after fertilization by the pollen; and again, the grains of pollen do not divide, the pollen-tube being an outgrowth of the inner wall of the pollen grain. The group of Gymnosperms contains Coniferae, Cycadeae, and Gnetaeae; so that the very great majority of flowering plants are Angiosperms.

Angiosperms are divided into two classes, MONOCOTYLEDONS and DICOTYLEDONS. Monocotyledons have only one cotyledon or seed-leaf; the veins of the leaves run more or less in parallel lines, as in grasses; the parts of the flowers are in threes; and in a section of the stem the woody vessels appear scattered. Dicotyledons have two seed-leaves; the veins of the leaves run into one another like the meshes of a net; the parts of the flowers are in fours or fives; and the wood grows in concentric rings, separating the central softer tissue from the bark.

ANGLE, RECTILINEAR (from the Latin word *angulus*, of the same signification). The notion (for it can hardly be called definition) is the *opening* made by two straight lines which cut one another. The length of the lines containing the angle (or legs as they are sometimes called) has nothing to do with its size, which refers in no way to the lines themselves, but only to their *inclination* towards one another.

Take the two angles or openings (fig. 1) made at the points A and B by the straight lines A P and A Q at A, and by B R and B S at B, and transfer the first figure to the second, so that the point A shall fall upon B, and the straight line A Q upon B S; or rather let as much of A Q as is equal to B S fall upon B S, and let the remainder

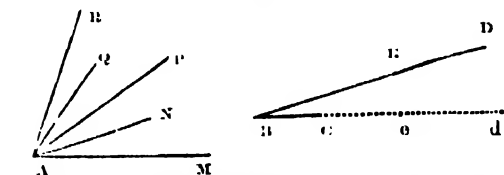
Fig. 1.



of A Q form a continuation of B S; also let A P and B R be made to lie upon the same side of B S. We have now no longer any control over the position of A P with respect to A Q, since the first figure is not to undergo any change except that of simple removal into another position. If, after A Q has been placed upon B S, A P then fall upon B R, the two openings or angles at A and B are the same. If A P in its new position fall between B S and B R, the opening or angle at A is less than that at B; and if A P fall further from B S than B R does, the angle at A is greater than that at B. The angle at A is called the angle P A Q, and that at B the angle R B S. Hence the notion of one angle being twice or three times, &c., as great as another may be fixed. For example (fig. 2), the angle M A P being made up of the two M A N and N A P, each of which is equal to the angle D B C, is twice D B C; the angle Q A M is three times D B C; R A M is four times D B C; and so on. Similarly the angle D B C is one-half of P A M, one-third of Q A M, &c. The angle made by two lines does not depend upon the length of these lines; if a part D E be cut off from B R, the angle is not

altered—that is, the angle $\angle BNC$ is the same as $\angle BDC$. If Bc and Bd be respectively equal to Bc and Bd , and if Bcd

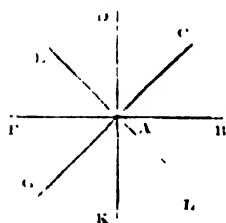
Fig. 2.



turn round B, the same *quantity of turning* which brings Bc into the position Bc , will bring Bd into that of Bd .

If a line setting out from A B be conceived to revolve round the point A, fig. 3, it will in every position form two openings or angles with its original position A B. For example, in the position A C, A B and A C will form the smaller angle $\angle BAC$, and the larger angle made up of the angles $\angle CAF$, $\angle FAK$, and $\angle KAB$. Only the former of these is usually considered in geometry, but the latter is frequently used in analysis. When half a revolution has been made,

Fig. 3.



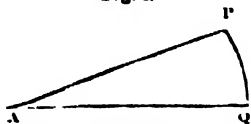
and A B has come to A F, at first sight we might say there was no angle formed; but on looking at the preceding position A E, we see that the opening of $\angle BAE$ and A F is greater than that of $\angle BAE$. The half of this opening $\angle BAF$ —that is, $\angle BAD$ —is called a right angle. A whole revolution makes A B pass through four right angles, and in analysis, if we wish to point out that the line A C is supposed to have made a complete revolution, and to have come into the position A C for the second time, the angle made with A B is said to be

4 right angles + $\angle BAC$.

For the most important properties of angles see TRIANGLE, PARALLEL POLYGON, TRIGONOMETRY.

The methods of measuring an angle, of which we think it necessary to take notice, are three in number. The first is the one universally employed in *theoretical* investigations, and is as follows:—The number which expresses what por-

Fig. 4.



portion the arc rq is of the radius, is the number chosen to represent the angle. It is shown in geometry that if any number of arcs be drawn with the centre, A, subtending the same angle, $\angle PAQ$, what part soever any one of them is of its radius, the same part is any other of its radius. That is, whatever circle may be chosen, the preceding measure gives the same number for the same angle. For example, if the arc rq be equal to the radius, the angle $\angle PAQ$ is the angle 1. If rq be two-thirds of the radius, the angle $\angle PAQ$ is the angle $\frac{2}{3}$. The unit of this measure is therefore the angle whose arc is equal in length to its radius.

The semi-circumference of a circle contains its radius 314 times, very nearly. This is then the number of theoretical units contained in two right angles. The right angle is therefore, 1.57; the degree, .0174; the minute, .00029; and the second, .0000048.

In the second method, which is that in common use, the whole angle traced out in one revolution, equal to four right

angles, is divided into 360 equal parts, each of which is called one *degree*, and marked thus ($^{\circ}$). Each degree is divided into sixty equal parts, each called one *minute* ($'$), and each minute into sixty equal parts, each called one *second* ($''$). Formerly the second was divided into sixty equal parts, called *thirds*, and so on; but it is now usual to use the tenths, hundredths, &c. of seconds. Four right angles = 360° , and one right angle = 90° .

The third method of measuring angles, in which they are said to be measured in *time*, is confined to astronomy, and is derived from the complete apparent revolution of the heavens which takes place in twenty-four hours. That is, if a line revolve round a point at the rate of a whole revolution in twenty-four hours, or a right angle in six hours, the times of moving through different angles are made the measures of their comparative magnitudes. Thus $4^h. 32^m. 60^s$ is the angle moved through by a star in 4 hours, 32 minutes, and 60 seconds. The degree, minute, and second of space respectively correspond to $4^h. 4'$ and one-fiftieth of a second of time; and the hour, minute, and second of a star's movement are respectively $15^{\circ}. 15'$, and $15''$ of space.

The following summary may be found convenient:—

An *angle* is the opening of two lines; *rectilinear*, of two straight lines; *curvilinear*, of two curves; *mixtilinear*, of a straight line and a curve. But in truth angle always means rectilinear angle, and when a curve enters, its tangent is the straight line which is used in determining the angle.

A *right angle* is half the opening of a straight line and its continuation, or the angle made upon a stationary line by another line which has swung round it through a quarter of a circle, as $\angle BAC$, fig. 3; an *acute* angle is that which is less than a right angle, as $\angle BAC$, fig. 3; an *obtuse* angle is that which lies between one and two right angles, as $\angle BAE$, fig. 3. The complement of an angle is that additional angle which is required together with the first to make up one right angle, thus $\angle CAD$ is the complement of $\angle BAC$, fig. 3; the supplement of an angle is that which, with it, will make up two right angles, thus $\angle CAF$ is the supplement of $\angle BAC$, fig. 3. When lines meet and make a pair of angles, the one less than two right angles is called *salient*, as $\angle BAC$, fig. 3; the other, greater than two right angles, is called *re-entrant* or *re-entering*, as $\angle BAE$, fig. 3, where B A is supposed to pass through the positions A, K, A, G, A, &c., to C A. None but salient angles are mentioned by Euclid. For salient and re-entering (which are borrowed from fortification) *direct* and *retroflexed* have sometimes been used.

The angles, like the letter Z, which two lines make with the same part of a third, on opposite sides of it, are called *alternate*. Two lines which cross one another make two pair of *vertically opposite* angles, as $\angle FAG$, $\angle CAB$, fig. 3. The angles made by adjacent sides of a figure are called *internal*; those made by any sides with adjacent sides produced are *external*. Thus if EF were joined (fig. 3) so that EAR became a triangle, the angle $\angle EAF$ would be internal and the angle $\angle EAB$ external. When the angular point is the centre or on the circumference of a circle, the angle is said to be *at the centre*, or *at the circumference*. Beginners often confound the angle with the angular point.

When one line falls upon another, the angle of *incidence* is the acute angle which the incident line makes, not with the other line itself, but with the perpendicular to the other. Thus CA falling on FN at A, fig. 3, CAD is the angle of incidence. When the incident line is thrown off again on the other side of the perpendicular, but on the same side of the second line as that from which it came, the new angle formed with the perpendicular is called the angle of *reflection*; when it is thrown off again on the other side of the second line, the angle with the perpendicular is called the angle of *refraction*. Thus CAD being the angle

of incidence, D.A.E. always equal to it, is the angle of reflection; G.A.K. might be the angle of refraction, varying with different media. These terms are nearly confined to optics.

A *dihedral* angle is the opening made by two planes; it is measured by a rectilinear angle, namely, that made by two lines drawn in the two planes perpendicular to their common intersection. But the rectilinear measure is not the same thing as the dihedral angle, though the two are often confounded. We might just as well say that the pressure of the air is the same thing as the number of inches in the barometrical column of mercury.

ANGLER, Frog-fish, or Sea-devil, are the common names of fish belonging to the genus *Lophius*. The British species, *Lophius piscatorius*, is found off the coasts of Europe, the Cape of Good Hope, and Western North America. The usual length of this British fish is 3 feet, but it often attains to a greater length even than 5 feet. It lives on other fish, which it catches by stratagem. The manner in which it effects this was an old story in the time of Aristotle, and Dr. Günther, our latest authority, maintains it in his "Study of Fishes." The mouth, which is the full width of the broad head, has an enormous gape. The jaws and palate are furnished with rasp-like teeth, pointing backwards, and capable of being laid flat, so as not to interfere with prey passing inwards. The lower jaw projects beyond the upper, and is fringed with jaw-langes like seaweed, fixed also on the body. This fish has an "extraordinary faculty of assimilating the colours of its body to its surroundings," so that it can readily conceal itself while on the watch. The three first spines of the dorsal fin are separated from one another, and modified into four feelers: the first has a joint somewhat like a link in a chain, which enables the fish to move it in any direction. When the angler is fishing it gets close to the bottom, stirs up the mud with its fins, and elevating its spines above the cloud moves them about as a bait, until some fish, attracted by hunger or curiosity, approaches and is instantly swallowed. Fish as large as itself have been found in its expandible stomach. In the Pedunculate, a family of the *ACANTHOPTERYGII*, to which the angler belongs, the carpal bones are protruded to form as it were wrists, to which the pectoral fins are jointed as hands; and by means of these the fish can cling to rocks or seaweed, or make a spring to seize its prey. The gill-opening is reduced to a small hole, so that they can live out of water longer than most other fish. (See Plate *ACANTHOPTERYGII*.)

AN GLES or **AN'GLI**, a German tribe who seem originally to have occupied the country on the E. of the Elbe, between the mouths of the Saale and Oder. The earliest record of them is in Tacitus' book on the Germans (chap. xl.); but he only mentions their name, states a few particulars relative to their religion, and intimates that they were a branch of the Suevi. It is clear that Tacitus knew very little about these nations. Lindenbrog and Lohmütz (C. Script. Rerum Germanicarum, tom. i. p. 81) have preserved fragments of the ancient laws used in common by the Angli and the Vandi. D'Anville has in his map assigned to them the same district which they occupied in the fifth century before their emigration to England, and parts of which the modern Angles still occupy. He allots to them the greatest portion of modern Schleswig and some part of Holstein, making the German Ocean their western boundary, the Saxons their nearest neighbours on the south, the Vandi on the south-east, and the Jutes on the north. It is impossible to fix with accuracy any boundaries for the Angli from the account given by Tacitus, but his statement appears perfectly reasonable with D'Anville's map and the Saxon Chronicle; and it is remarkable that D'Anville in every respect agrees with the last-mentioned record,

although it may be doubted whether he knew it or paid any attention to it. See SAXONS.

ANGLESEA, MARQUIS OF, HENRY WILLIAM PAGET, was the eldest son of Henry, first earl of Uxbridge, and was born 17th May, 1768. He entered the army in 1793, having raised among his father's tenantry the 80th Regiment, or Staffordshire Volunteers; and in 1794-99, as a lieutenant-colonel of dragoons, won "golden opinions" during the Duke of York's unsuccessful campaigns in Flanders and Holland. Promoted to the rank of lieutenant-general, he served in Spain with Sir David Baird's force, designed to co-operate with Sir John Moore; and near Sahagun, 21st December, 1808, with a body of 400 horse defeated a French cavalry force nearly twice as strong, and captured 120 prisoners. He distinguished himself greatly at Coruña. On the death of his father, in 1812, he became earl of Uxbridge. At Waterloo he commanded the British cavalry, and led one of those brilliant charges which so greatly demoralized and discouraged the French infantry. At the close of the battle he received a severe wound, and his leg was amputated in the village of Waterloo. Five days afterwards he was created Marquis of Anglesea. In March, 1828, he was appointed viceroy of Ireland, and during his tenure of office acquired a brilliant popularity by espousing the cause of Catholic emancipation. He was nominated to this important post a second time in 1830. From 1846 to 1852 he was master-general of the ordnance, and supported every liberal and progressive measure of legislation with characteristic warmth. He died, full of years and honours, 29th April, 1854.

ANGLESEY or **ANGLESEA**, an island in the Irish Sea, on the N.W. coast of Wales, in which principality it is included, and from the mainland of which it is separated by the Menai Strait. Its breadth, from Aber-Menai Ferry to Trwyndŷ Point, is 17 miles; its length, from Carnel's Point to the Menai, is about 20 miles. The circumference is 80 miles. The N.W. coast is much indented, and there



Cromlech in the Park of Plas Newydd.

are some strange water-worn rocks. There are several smaller islands round the coast. Holyhead, the largest, separated from Anglesey by a sandy strait, is at the western extremity; and Priestholm, or Puffin Island, at the eastern.

This island had in early times the names of Ynys-Dowell (the shady or dark island), Ynys-Fon (the furthestmost island), and Ynys-y-Codeirn (the island of heroes). By the Latin historians it is called Mona (which name it shared with the Isle of Man); the name of Anglesey (which signifies island of the Angles) it received from the Saxons. It was a great seat of the superstition and power of the Druids, and formed their safest retreat. In 61 A.D. they were attacked by the Roman general, Suetonius Paulinus, and almost destroyed; and in 78 Agricola completely subjugated them. Several Druidical remains still exist, especially *cromlechs* (flat stones resting upon others), and *carnedd*s (heaps of stones). One of these cromlechs is here shown.

With the exception of a short government by the West Saxons in the ninth century, Anglesey was governed by native princes till the reign of Edward I., when it became subject to England.

The sea breezes render the climate of Anglesey milder than that of the adjoining part of Wales; snow seldom lies long, even in the depth of winter; but the air is, from the same cause, loaded with frequent mists in autumn.

The surface of the island is comparatively flat; and the scarcity of trees, as well as of quickset hedges, gives it a barren appearance. The limited extent of the island does not admit of the formation of any considerable stream. The coast forms several harbours, the principal of which are Beaumaris and Holyhead. That of Amlwch has been formed by excavating the rock.

The soil of the island is various; the lands on the sea-



Water-worn Rocks, Isle of Anglesey.

coast, especially on the western side, are sandy; the low grounds are chiefly covered with a peaty earth, from which the peasantry dig turf for fuel. The more prevalent soil is, however, a stiffish loam, which, when manured with sand, produces abundant crops. The chief agricultural productions are oats and barley; of wheat the proportion is small, and of rye still smaller. Potatoes are grown in greater quantity than in any other part of North Wales, and the cultivation of the turnip is on the increase. Pasturage is, however, the great object of the farmer's attention, for only one-third of the inclosed lands is under tillage. Cattle and sheep are reared and exported in large numbers. The Anglesey sheep are the largest native breed in North Wales; they have white faces and legs, and are generally without horns. Considerable trade is also carried on in butter, cheese, hides, and honey. The coasts supply abundance of fish.

The Mona and Parys copper mines are noticed under AMLWCH. Lead ore is also found in Parys Mountain. Limestone ranges traverse the island; marbles, both white and variegated, are procured; millstones are quarried at Redwharf and Penmon; and there are coal-mines at Malltraeth, but they do not appear to have been worked with much success.

The main road to Holyhead runs through the island. It crosses the Menai Strait, over a magnificent suspension bridge erected by Telford in 1826. The Britannia tubular bridge was constructed to carry the North-western Railway over the same strait in 1850. The Anglesey Central Railway is intended for local traffic.

The county of Anglesey is divided into three cantrefs, a division which originated at a very early period; and these

cantrefs are subdivided each into two cwmots (cwmotws). It is in the diocese of Bangor. It returns one member to Parliament for the county. Beaumaris (the capital) and some other district boroughs formerly returned another member, but they ceased as district boroughs in 1885.

The area, including Holyhead Island, which forms part of the county, is 193,511 statute acres. The population in 1881 was 51,116.

ANGLICAN or **ANGLO-CATHOLIC**, terms used to designate the Established Church of England with its offshoots the Protestant Episcopal Churches of Ireland and Scotland, the Colonial, Indian, and American Episcopal Churches. The names are used with varying signification, being sometimes applied to the Church of England as it existed in the earliest times, and sometimes being confined to the church as it has existed since the Reformation. See ESTABLISHED CHURCH.

ANGLING, the art of fishing with a rod and line. This ancient and favourite recreation may be said to have a history of its own. In the records of the Old and New Testaments, on the monuments of Egypt, and scattered amongst the treasures of classic literature, there are references which show that in all times there were men who took delight in the art of angling. In England during the seventeenth century, pre-eminently a time of strife and national disturbance, many of the quieter spirit cultivated a natural disposition for a pastime which could be followed in retirement and peace. Izaak Walton, the apostle of the "gentle craft," who flourished during this period, gave a great impetus to the love of angling in England, and even now many of the hints and directions contained in his "Complete Angler" will be found very useful to the modern disciple.

The quiet wit, chaste imagery, and quaint and simple language which characterize Walton's writings will also afford pleasant and instructive reading. Not the least advantage of the practice of angling is found in the surroundings to which it leads. As sang Sir Walter Raleigh—

"Blest silent groves! O may ye be
For ever mirth's best nursery!
May pure contents
For ever pitch their tents
Upon these meads, these downs, these rocks, these mountains,
And peace still linger by these purring fountains,
Which we may every year
Find when we come a-fishing here."

The practice of angling may be divided into three general classes, either of which should be followed according to the nature of the water or the characteristics of the fish by which the water is inhabited. The most skillful mode of angling is that of "whipping" the surface of the water with an artificial fly. Scarcely less experience is needed in the use of "spinning" tackle adapted to mid-water. "Bottom" fishing, being the simpler mode, is more generally followed. The tyro should begin with the latter method, and seek to become a proficient angler by mastering the entire science of the craft. This accomplished, the lakes, broads, rivers, and streams of the country will yield sport of one kind or another throughout the year.

In the Plate prefixed to this volume we give illustrations of representative artificial lures; of course there are many varieties in existence, but we only select those which are most widely known, and whose names should be familiar to all. Fig. 1 is the far-famed blue plafton, which is chiefly made of painted waterpots of silk, while the Totnes minnow (fig. 2) is wholly made of metal. Of salmon flies we give Jack Scott (fig. 7) as a worthy representative of the old and still most popular pattern of fly, while fig. 8 shows the new and skeleton-like type, with two separate and very thin wings and two hooks. Of trout flies we give a selection from the puzzling variety which tackle-makers recommend: the brown palmer (fig. 9) is chiefly serviceable in March, the stone fly (fig. 10) in April and September, the gray drake (fig. 11) and brown moth (fig. 12) in May, the red spinner (fig. 13) in June, the black gnat (fig. 14) in June and July, the willow fly (fig. 15) in August and September, and the whirling dun (fig. 16) in April and September.

The fly is adapted for swift rivers with deep pools and circling eddies, the habitat of the salmon, which is the angler's noblest quarry. The fly is also the most killing bait in trout streams all over the kingdom, and for grayling in the rivers of Derbyshire and elsewhere. As regards the selection of the fly, it should, generally speaking, be small where the water is clear, and large and bright where the pool is deep or the river turbid. Nature will generally be the best guide to the fly to be imitated; the angler will not be far wrong who uses the fly which at any given season or locality may form the actual food of the fish it is the object to secure, and to assist him we give illustrations of those natural flies which form the staple food of the trout: the "caddis" (fig. 3) is usually to be found at the bottom of still water; the caddis fly, or stone fly (fig. 4), crawling on the stones, &c., at the margin of the stream; while the March brown (fig. 5) and the May fly (fig. 6) are to be seen in thousands hovering over the water during the first warm days of spring. The rod should be strong, though light and supple, whilst the great thing to be sure of with hook and line is strength combined with lightness. The quality of the tackle is obviously of the first importance to success, but great skill is needed in wielding the rod so as to cast the fly in any given spot, and to insure that it shall gently touch the surface of the water before the line can reach it. When the bait is taken the strike should be quick

but gentle, and the capture of the fish will then almost entirely depend on the tact and temper of the angler. Patience, however, will bring success, and with it that encouragement which is necessary to make an expert at the craft.

Weirs and lock-pools are favourite haunts of trout and pike, and the angler will here find ample scope for mid-water fishing. Spinning with a dead or artificial bait on a flight of hooks is the most effective mode, and will afford tests of skill almost equal to those experienced by the fly-fisher. The tackle must be stronger, as the heaviest trout and huge pike are often taken by this means. Where the water is less clear of weeds and other obstacles similar tackle will do for "trolling," especially where the voracious pike is the object of the angler, but the bait and hooks will require to be arranged on a different principle. Live-bait fishing is also largely practised for pike.

Many varieties of fish are taken by the simpler mode of angling on or near the bottom of the stream. Barbel, chub, roach, perch, dace, gudgeon, carp, bream, tench, eels, and other fish may be taken in this way. These fish are common to most of our rivers and lakes, although some inhabit still, deep water, whilst others prefer running streams. Fish bite sharpest in running water, and are sweeter for the table when taken from the larger rivers. These are matters with which the angler very soon acquaints himself. Brandlings and red worms scoured in moss, gentles kept in sand, caddis-worms, and the larvæ of the wasp are baits which may be used for most coarse fish. It is also well to use ground-bait composed of bran and other matters to attract the fish to the selected "swim." Lobb worms are favourites with barbel, a heavy fish that is generally caught with a "ledger" or stationary bait lying at the bottom of the river. Perch like a bright-red worm, and will readily take a minnow; the "paternoster," a series of hooks arranged a few inches from each other, is useful for perch; and jack are sometimes taken in this way. Chub, which may also be caught with a fly, are fond of beetles and grubs. Carp and bream are heavy fish, chiefly inhabiting sluggish rivers, ponds, and lakes; whilst the gudgeon—a sweet little morsel—affords capital sport for the tyro in mid-stream.

There are "seasons" when fish may be properly taken, the coarser varieties being in best condition in the autumn and winter months. Salmon and trout come on in early spring, and offer a fine field of sport throughout the entire summer. The angler should be at his work in the early morning, and may find his chief reward as the shades of evening are closing in. Cloudy days are the best, and a south-westerly wind is considered most favourable. The water is in good condition when a little tinged after rain, the fish being then less "shy" and more active in the search for food. The patient angler, however, will not too much regard either the wind or the clouds, but as opportunity offers will re-echo the aspiration of Izaak Walton—

"I in these flowery meads would be,
These crystal streams should solace me;
To whose harmonious bubbling noise,
I with my angle would rejoice."

Rules and regulations for the preservation of our waters from unfair and unseasonable fishing, based upon Acts of the legislature, are enforced in most rivers and lakes by conservancy boards and angling preservation societies. A good deal is likewise accomplished by these latter bodies to introduce fish from other countries. The char and the bass from the American rivers and lakes are amongst the best of these importations. They are lively fish and give fine sport. Great numbers of salmon and trout are hatched by artificial process and turned into our rivers for the benefit of anglers, although much of the small fry is consumed by the voracious pike and perch.

ANGOLA, a country on the west coast of Africa, of

somewhat uncertain boundaries, but by most English geographers and explorers considered as lying between 8° 20' and 9° 20' S. lat., bounded on the N. by the Congo, and on the S. by Benguela. The region, which by the natives is also designated Dongo, is mountainous and well supplied with water, although along the sea-coast there is a broad flat sandy plain. It was first discovered by the Portuguese navigator, Diego Cam, in 1486. Very soon after this the Portuguese began to form settlements both along the banks of the Zaire, and at various points of the coast to the south of that river. It was not, however, till 1578 that the town of **St. PAUL DE LOANDA**, the capital and chief port of Angola, was begun to be built, and it became the residence of the Portuguese governor. In 1610 the Portuguese were driven from Loanda by the Dutch, who retained possession of the place till 1618, when it was recovered by its former masters. It has ever since remained in the hands of Portugal.

The Portuguese settlements extend into the interior, and comprise forts and commercial depots, separated by considerable distances. Two of these depots or *feiras* (fairs) are 700 miles inland, and are under the superintendence of a Portuguese resident. The Portuguese colonists and the natives meet at these stations for the purposes of exchange.

The country has been divided by the Portuguese into seven districts—Loanda, that in which the capital is situated; Danda, adjacent to the river of the same name, described as abounding in corn, fruit, and venison; Benga, on the banks of the Benga (otherwise called the Zenza), and altogether inland; Moseche, between the Luena and the Coanza, being the province in which the two forts of Massangano and Cambambe are situated; Ilamba, between the Danda and the Benga, divided into the lower province next the sea, and the higher, called otherwise Lumbo, further inland; Oarii, to the east of the former; and Embacca, or Membacca, comprehending the upper region of the Luena. The entire population is estimated at 250,000, of whom not more than 2000 are Europeans.

The language spoken in Angola is the Bunda, which appears to be merely a dialect of the Congose, or that spoken as far north as Cape Catherine. A grammar and dictionary of this tongue have been compiled by Father Cannecattim. The government, laws, and religion prevailing among the natives of Angola are in their general features the same with those of the other negro tribes of Africa. The supreme authority in each district is in the hands of a single ruler, who is subject to no regular control. A tax is levied by the Portuguese from the inhabitants of Loanda, and of the other small districts where they have erected forts. In the course of the sixteenth century various missions were sent out by successive popes with the object of diffusing the knowledge of Christianity among the inhabitants of this part of Africa, and by dint of force as well as of persuasion a good many converts were made; but few negro Christians now exist here. The country is well wooded and fertile, producing palms, citrons, and other fruits, and the sugar-cane in abundance, as well as cotton and grain. The minerals are gold, silver, lead, sulphur, and iron; petroleum is also found. Wild animals abound, and the sheep, cow, and horse have been introduced. The climate is salubrious in the interior. The exports from Angola formerly consisted chiefly of slaves and ivory; but slavery has been entirely abolished, and gum and wax, together with ivory, now constitute the chief articles of commerce. Of late years a considerable trade has been done in the fibre of the "baobab," or monkey fruit tree. The adaptability of the fibre to paper-making was discovered by Mr. Monteiro, and a new and profitable trade was thus established. ("Angola and the River Congo," by J. J. Monteiro, London, 1876.)

ANGORA or **ENGURI**, a city of Asia Minor, in 39° 56' N. lat., 32° 50' E. lon. Its ancient name was *Ancyra*. It is pleasantly situated on the river Enguri, 220 miles E.S.E. of Constantinople. Tradition ascribed its origin to Midas, and its inhabitants exhibited in a temple of Jupiter a sacred anchor which was said to have been discovered at the time of its foundation. This was probably a Greek invention to account for the name of the city; an anchor (in Greek, *ankura*) appears on the coins struck in the reigns of the Antonini, Severus, and Caracalla. When the Galli or Galatæ established themselves in Asia Minor, Ancyra became the capital of a tribe which had originally come from the neighbourhood of Toulouse, called Tectosages. In B.C. 189 the whole of Galatia was subdued by the Roman general Manlius, and it became virtually dependent upon Rome. Towards the close of the republic, Dejotarus, who was only tetrarch of the Tectosages, had extended his authority over the other Galatian tribes, and assumed the title of king; but under Augustus (B.C. 25) the whole country was reduced to the form of a province, of which Ancyra was still the capital. Though deprived of its nominal independence, the city flourished under the favour of Augustus. It was permitted to assume the name *Sebaste* (the Greek term corresponding to the Latin *Augusta*), and at the death of the emperor, when an inscription on bronze was erected at Rome to commemorate his achievements, the citizens of Ancyra procured a copy and had it inscribed on marble in Greek and Latin, on a temple dedicated to Augustus and Rome. This inscription, called the *Monumentum Ancyranum*, was discovered in 1554 by Wrantz, bishop of Agria, and an ambassador from Ferdinand II. at the Ottoman Porte. A more correct copy was taken by Tournefort in 1701, and by him communicated to Chishull, who supplied many of the lost words by conjecture, and published it in his "Asiatic Antiquities." It has been repeatedly printed since, particularly as an appendix to the writings of Tacitus (Oberlin's edition, tom. ii. p. 586). The latest copy that has been made of the Latin inscription is by Mr. Hamilton, who also copied so much of the Greek translation as is legible ("Appendix," No. 103). Suetonius ("Augustus," c. 101) speaks of the original inscription at Rome, from which the *Monumentum Ancyranum* was copied. The importance of Ancyra under the empire is proved by its numerous coins, and by the number of its public buildings, and the inscriptions found in all parts of the town. It was the seat of one of the earliest Christian churches; and in the years 314 and 358 Christian councils were held there. Pagan worship, however, had not yet ceased when the Emperor Julian visited Ancyra in 362. As the power of Rome declined, the frontiers were exposed to the ravages of various enemies. In 625 Ancyra was taken by a general of the Persian Chosroes. In 1085 it was captured by the Turks, but in 1102 was recovered for a time by the Franks. After being for some time the capital of the Turkish empire, it was taken by Tamerlane, after his defeating Bajazet in a great battle near Ancyra, 28th July, 1402. In 1415 it was recovered by Mohammed I. There are remains of the famous *Marmor Ancyranum*—a white marble temple in honour of Augustus. The modern town has manufactures of stuffs and yarns from the fine wool of the Angora goat, and also leather from the skins. The exports are Angora wool, yellow berries, red dye, gums, wax, honey, goats' hides, and Angora cat skins. The population was estimated at 38,000 in 1882. Angora is the principal residence of the Catholic Armenians in the Turkish empire. (Tournefort, "Voyage du Levant," tom. ii. p. 244; "Mémoires de l'Académie des Inscriptions," tom. xxxix. p. 391; Rasche, *Lexicon Rei Nummarie*, article "Ancyra;" Hamilton, "Researches in Asia Minor," &c.) There was another

Ancyra in Phrygia Epictetus, the precise position of which is unknown. The coins of both towns have the name in the form ANKTPA, not AKTPA.

ANGOR NOW or **NGORNU**, a town of Bornu, in Central Africa. It is situated near the borders of Lake Chad, from the waters of which it is liable to inundations, and is a place of considerable importance. The population, which numbers about 30,000, carry on a large trade in amber, coral, metal, cotton, and slaves.

ANGOSTURA, also known as **Ciudad Bolívar**, or **Santo Tomé de la Nueva Guayana**, a town of Venezuela, in South America, and capital of the province of Guayana, is situated on the Orinoco at a distance of about 210 miles from its mouth. The town is built on the south bank at a place where the bed of the river is narrowed on both sides by rocks, and to this circumstance it owes its name Angostura, which signifies the "Strait." It lies between the foot of a hill and the river, and the houses stand partly on the bare rock; they are in general lofty, agreeable, and mostly built of stone, and on the tops are terraces, where people sleep in the season of the greatest heat. The streets are regular, and for the most part parallel to the course of the river, which sometimes floods the town. Angostura contains a cathedral, college, city hall, and hospital, and is the seat of a bishop. In 1807 the population was about 8500, of whom 300 were negroes. The number decreased in twenty years to about 3000, but has now again reached 8000. Though at so great a distance from the ocean, the town is only about 121 feet above the level of the sea; and notwithstanding its tropical situation it enjoys a mild and equal temperature. This is in part to be attributed to the trade-winds, which blow regularly from November to May.

The channel between the town and the island Del Medio, which lies between the two forts mentioned above, has 200 feet of water when low, and on the increase of the river 50 or 60 feet more. But large vessels cannot sail up to the town on account of the shoals, which are very frequent in the lower part of the Orinoco; only such as do not draw more than 8 feet can navigate it with safety.

The inland commerce of Angostura extends to a great distance westward by means of the numerous large navigable rivers which run from the eastern declivity of the Cordillera to the Orinoco. Considerable trade is carried on in cacao, indigo, cotton, sugar, hides, jerked meat (meat dried in the sun), and the bark to which Angostura gives its name.

In 1819 Angostura was the scene of a congress, the result of which was the formation of the republic of Colombia by the union of New Granada and Venezuela. It derives its modern name from Simon Bolívar, who freed the country from Spanish rule.

ANGOSTURA BARK (*Angustura Bark* or *Cusparia Bark*) is the bark of the *Galipea Cusparia*, a tree which grows in Eastern Venezuela at a height above the sea level of 600 or 1000 feet. It is an aromatic tonic and febrifuge, and causes purging if given in large doses. In Europe it is not now very much used; but in South America it is considered very valuable for the treatment of dysentery, atonic dyspepsia, and chronic diarrhoea, and certainly is of great use in the low malignant fevers prevalent in the swampy districts. The medicinal properties are due to a combination of two constituents, a volatile oil and a bitter principle (*angusturin*). The bark is imported from South America and the West Indies. A Japanese bark has been substituted, brought from the East Indies. It has been found to be the bark of *Strychnos nux-vomica*, and may be known from the true bark by having an intensely bitter taste and no smell; while white spots of excrete of lime may be seen (and more distinctly with a lens) on the freshly broken surfaces of the angostura bark.

ANGOULEME, the capital, formerly of the province of Angoumois, now of the department of Charente in France, is situated on the left bank of the Charente, 287 miles S.S.W. of Paris. It stands on a high hill above the valley of the Charente. The air is pure, and the prospect from the ramparts, which have been converted into public walks, is extensive and fine. Though occupying so high a site the town is abundantly supplied with fresh water, which is raised by machinery. The population, including the suburbs, was 30,000 in 1882. The ancient part of the town is ill-built, and the streets are narrow; but the modern part is much better in these respects. Among the principal buildings are the cathedral—a very fine and complete example of Romanesque architecture—the handsome Hotel de Ville, the bridge over the Charente, and the obelisk raised by the government of Charles X. to the Dauphiness, whose husband took the title of duke from the town. There are also some remains of a castle, which was formerly the chief residence of the ancient counts of Angoulême. The city is the seat of a bishop, whose see includes the department of Charente. The principal scientific establishments are—a college, schools of design and chemistry, a museum of natural history, and a public library which contains 14,000 volumes and some valuable manuscripts. The chief manufactures are paper, woollen stuffs, and earthenware; there are also distilleries and sugar works. Wine and saffron are produced in the district around the town, and considerable trade is carried on in grain, fruit, and salt. The Charente is navigable for steamers to Angoulême.

Angoulême is a town of great and indeed unknown antiquity. It was the *Iculiana* of the Romans. In the ninth century it was ruined by the Normans, and was twice taken by the Huguenots in the sixteenth century. It was the birthplace of Margaret de Valois, Balzac, and Montalembert.

ANGOUMOIS, a district which formed one of the thirty-three provinces into which France was divided before the revolution in 1789. It is now included in the department of CHARENTE.

ANGRA, the capital of Terceira, and of the whole group of the Azores, is on the south coast of the island. It stands on an inlet, from which it derives its name, *angra* in Portuguese meaning an "inlet." Angra has always been the residence of the governor; it is also an episcopal town, and contains a cathedral, five parish churches, a military college, and an arsenal. It is fortified and defended by a castle, but has a very much exposed harbour. It exports wine and grain, but its foreign trade is not considerable. The Portuguese regency took refuge here from 1830 to 1833. The population is about 12,000.

ANGUIL LA, or **SNAKE ISLAND**, in the West Indies, forming one of the Lesser Antilles group, is 8 miles N. of St. Thomas, and has an area of 35 square miles. It is a British possession, under the governor-in-chief of the Leeward Islands colony. It lies low, and is wooded. Its chief products are sugar, cotton, tobacco, and maize. Salt is manufactured from a lake in the island, but fresh water is scarce. Phosphate of lime has been discovered. It cannot be said to possess a good harbour on account of the reefs which prevail. Population, 3000.

ANGUIL LA. See **ENG.**

ANHALT, a duchy of Germany, with an area of 900 square miles. It is entirely surrounded, as well as partly intersected by Prussian Saxony. Alterations were made in its boundaries in 1868 and 1870. The present area is about 869 square miles. It is watered by the Elbe, which flows through it from E. to W., and by its tributaries the Mulde and Saale. The south-west districts are hilly, but it is flat elsewhere. It produces corn, fruit, flax, hemp, tobacco, timber, silver, copper, iron, and coal;

rears a considerable quantity of cattle and sheep; has some manufactures of linen, cotton, and woollen goods, and metallic and earthen wares; and had 232,592 inhabitants in 1881, nearly all of whom are Protestants, both prince and people having embraced the Reformation and dissolved their monastic institutions between the years 1521 and 1532. The chief towns of Anhalt are—Dessau (the capital), Zerbst, Köthen, and Bernburg. The form of government is monarchical, and the sanction of its diets is required to the imposition of taxes, though the fundamental laws rest on the various ordinances promulgated by its princes. The ancestral seat of the princes of Anhalt was the stronghold of Anhalt, on the Hartz, which is said to have been built in 940. Its only remains at the present day are the crumbling fragments of some of its vaults. Upon the death of Prince Joachim in 1586 (the inheritance of the several branches of the House of Anhalt having been united in his person) his four sons divided the principality between them; and thence arose the respective sovereignties of Dessau, Bernburg, Zerbst, and Köthen. The whole territory is now under a single ruler. Several of its princes have figured in political affairs, and shown great zeal in the Protestant cause.

AN'HOLT is a small Danish island in the Kattegat, 56° 38' N. lat., 11° 35' E. lon., surrounded by dangerous shoals. It is 6 miles long by 2 broad, possesses a lighthouse, and has a population of about 200.

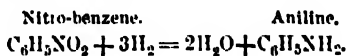
ANHYDRIDES, the oxides of acid radicles. They are sometimes termed anhydrous acids; the older chemists erroneously considered them acids. They all become acids by addition of water: thus SO_2 (sulphuric anhydride) + H_2O (water) becomes H_2SO_4 (sulphuric acid). The best known anhydrides are the sulphuric, nitric, carbonic; the latter is still in common parlance carbonic acid.

ANIEL'LO, TOMMASO, called by corruption **MAS-ANIEL'LO**, a young fisherman, and a native of Analfi, lived at Naples towards the middle of the seventeenth century, under the government of the Duke d'Arcos, viceroy of Philip IV. of Spain. Naples was then suffering all the evils of delegated absolute power; its treasures went to Spain, its youth were sent to fill up the ranks of the Spanish army, and both were wasted in ruinous wars for the ambition and selfish views of a distant court. In the year 1647, the Duke d'Arcos, in order to defray the expenses of a war against France, thought, as a last expedient, to levy a tax on fruit and vegetables, the common articles of food of the Neapolitan people. The edict which announced this fresh impost occasioned the greatest ferment, especially among the poorer classes of the inhabitants. An old priest of the name of Gennaro, who had been in prison for some former offence, contributed to inflame the general discontent. Masaniello, who was then about twenty-five years of age, and who, by his humour and natural quickness, was a great favourite among the people of the *mercato* (the great market-place of Naples), spoke loud among his friends against the new tax. His wife had been arrested some time before at the gates of the city, as she was trying to smuggle in some flour, which, like everything else, was a taxed article. She was kept in prison several days, and her husband had to pay in order to obtain her release. Masaniello had accordingly, as we might expect, conceived a violent hatred against the Spanish government. He was at the head of a troop of young men who were preparing for the great festival of our Lady of the Carmel, by exhibiting sham combats, and a mock attack on a wooden castle. On the 7th of July, 1647, he and his juvenile troop were standing in the market-place, where, in consequence of the obnoxious tax, but few countrymen had come with the produce of their gardens. The people looked sullen and dissatisfied. A dispute arose between a countryman and a customer

who had bought some figs as to which of the two was to bear the burden of the tax, and this led to a riot against the municipal authorities. Masaniello then addressed the people around him in a speech of coarse but fiery eloquence. He described their common grievances and miseries, and pointed out the necessity of putting a stop to the oppression and avarice of their rulers. "The Neapolitan people," said he, "must pay no more taxes!" The people cried out, "Let Masaniello be our chief!" The crowd now set itself in motion, with Masaniello at their head; it rolled onward, increasing its numbers at every step. The few Spanish and German troops of the vicerey were defeated, and obliged to defend themselves within the castles. The vicerey in this extremity proposed Cardinal Filomarino, the archbishop of Naples, who was a man of ability, and withal popular, to act as mediator between him and the people. Articles were drawn up under Masaniello's direction, by which all imposts upon articles of consumption were abolished, and the privileges granted by Charles V. restored, besides an amnesty to all concerned in the insurrection. The Duke d'Arcos, after signing the treaty, put a gold chain round Masaniello's neck, and saluted him as duke of St. George. Masaniello returned in triumph to his humble dwelling, and peace was momentarily restored.

But Masaniello's mind began to exhibit symptoms of derangement. His sudden and giddy elevation, the multiplicity of questions referred to him, his total inexperience of business, the heat of the season, and want of sleep—all helped to derange his intellect. He became suspicious, capricious, absurd, and even cruel; and at length, after committing many extravagances, on the 16th of July was evidently insane. He on that day escaped from his friends, and addressed the people in the Church del Carmine in a discourse, at first affecting, but at length wild and incoherent. Masaniello was taken down from the pulpit by the priests; the archbishop spoke to him kindly, and advised him to rest and calm himself awhile in the adjoining convent. He was taken into one of the cells, where a change of clothes was given him, and he lay down on a couch and rested a few minutes. Armed men soon appeared at the cell door. Masaniello turned towards them: "Here I am. Do my people want me?" A discharge from their arquebuses was the answer of the wretches; and Masaniello fell, exclaiming, "Ungrateful traiters!" and expired. His head was cut off, fixed on a pole, and carried to the vicerey, the body dragged through the streets by a troop of boys, as he had himself foretold a few days before, and then thrown into a ditch. The people then appointed the Prince of Massa their chief, but soon after murdered him, and afterwards chose Gennaro Annese, one of the villains who had plotted against Masaniello's life.

AN'LINE or **ANILINE OIL** is the name given in commerce to a mixture of bodies amongst which organic bases, known as the aniline homologues, preponderate. Aniline proper, otherwise amidobenzene or phenylamine ($\text{C}_6\text{H}_5\text{NH}_2$), was discovered by Unverdorben in 1826 as a product of the dry distillation of indigo. It is now generally prepared by the conversion of benzene into nitrobenzene, and subsequent reduction by nascent hydrogen or other reducing agents equivalent thereto.



Aniline is a colourless oily fluid which reflects light strongly and has a weak aromatic odour; it is sparingly soluble in water, but is very soluble in ether, alcohol, carbon disulphide, and hydrocarbons. It boils at 182° C.; its specific gravity is 1.02. By exposure to air it turns brown, probably by oxidation. Its basic properties are well marked, a large number of well-defined salts being obtainable from it. It is a powerful narcotic poison.

Aniline throws down the hydrates from solutions of many metallic salts.

In 1856 Perkin discovered the production of mauve by the oxidation of aniline sulphate by potassium dichromate; this process he subsequently patented. The manufacture of aniline soon became a recognized industrial operation, the cheapest source being nitro-benzene, which was derived from the benzene occurring in coal tar. The discovery of fuchsin by Verguin in 1858 as a product of dehydrogenation of aniline oils, and the discoveries of triphenyl rosaniline (bleu de Lyons), ethylated and methylated rosanilines (Hofmann's blues and violets), aldehyde green, iodine green, violets de Paris, and many other beautiful and permanent dyes, added rapidly to the magnitude and importance of the trade in colours derived from aniline oils. The value of the aniline dyes now yearly manufactured is estimated to exceed £3,000,000 sterling.

ANIMAL. All natural objects [see NATURAL HISTORY] may be divided into those which have life and those which are without life: the former class comes under the sciences of BIOLOGY, ZOOLOGY, and BOTANY, while bodies without life may be viewed under various aspects, such as chemical elements [see CHEMISTRY], ROCKS, and MINERALS. These two great classes of natural objects are well marked off from one another in various particulars. 1. The elements which make up living bodies are principally four—viz. carbon, hydrogen, oxygen, and nitrogen—together with small quantities of some others. 2. These various elements are combined in very complex proportions in living bodies. 3. With life is present an *organized* structure; all living beings therefore being spoken of as *organisms*. The element of all organized structures is a minute mass of protoplasm, and this sole constituent is called the *cell*. Cells are united to form *tissues*, and tissues make up the various *organs*. 4. Inorganic (or dead) matter exists more or less in masses, and the notion of individuality is not applicable as it is where life is present. 5. In living beings there is a beginning and an end, a birth and a death, with intermediate periodic changes, and an adjustment of the organism to external influences. 6. Every organism has the power of *assimilating* food to repair waste, i.e. of taking from material outside itself particular chemical compounds, and building up these into definite tissue. This division of things into organic and inorganic is natural and readily apparent; but when the attempt is made to go further, and give characteristics which will effectually separate the organic world into the two kingdoms, animal and vegetable, the task becomes so difficult that some students of biology are led to maintain the existence of a third kingdom intermediate between the animal and vegetable. To this debatable land Professor Haeckel has given the name *Regnum Protista*. Others again object that, instead of one boundary line, this necessitates two, and these no better defined than the single one. To trace out the whole life-history of these low organisms is a matter of very considerable difficulty, and it may be that with further investigation a definite place will be found for them either in the animal or vegetable kingdom, or, on the other hand, it may become clearly manifest that there is no boundary line in nature. Biologists are now for the most part agreed that the power of taking in solid matter (e.g. as in the case of *Amoeba*) is characteristic of an animal; whereas the power of constructing protoplasm, like the yeast plant) out of a simple chemical compound, such as ammonium tartrate, is evidence of a vegetable nature. Mr. Saville Kent, in his "Manual of the Infusoria," adds two other tests:—(1) a peculiarity of motion, those forms which are animal move as if they know where they are going and what they are meeting, whereas vegetable forms (e.g. the *Volvox*) roll along "blindly;" (2) in animal forms alone there is a "contractile

vesicle"—a round clear space which suddenly disappears and appears again, like the revolving light of a lighthouse. In the case of higher animals there is not so much difficulty.

1. Animals possess a stomach which either is distinct from the general cavity of the body, or may be the body cavity itself, as in the hydra; 2, nutrition in animals is a process of oxidation, in plants of deoxidation; 3, the food of animals is organic matter, that of plants almost always inorganic matter; 4, animals, except the lowest forms, possess a nervous system; and 5, their tissues and organs are more in number and more complex than those of plants.

CLASSIFICATION is of the utmost importance as well to those just beginning the study of zoology as to those who have devoted their lives to it; and the reason of this will be at once evident when the general problem of classification is thus stated:—"To provide that things shall be thought of in such groups, and those groups in such an order, as will best conduce to the remembrance of their laws" (Mill's Logic). From this statement, too, the fact may be gathered that classifications are continually altering as our knowledge of the laws of nature becomes more thorough. A perfect classification depends upon a knowledge (1) of the history of the *anatomical development* of each organism, and (2) of the uses to which it puts its organs (*physiology*). Under anatomical development is included not only a consideration of the anatomy of the adult, but also its development from the embryo, as well as changes induced by climatic and other influences, and transmitted to the offspring so as to become hereditary. If we accept Darwin's theory of the origin of SPECIES, we should also trace the development of each animal from the lowest forms through intermediate steps to its present condition. But this last requirement cannot well be fulfilled, as the only means open to us for the purpose is the study of fossil remains (PALÆONTOLOGY). Fossils, as a rule, are only the harder parts of animals—bones, shells, &c.—changed often in structure, and sometimes the least important part of the animal. Besides this, the geological record is incomplete; there are frequent gaps which possibly represent ages, and which we can never hope to be able to fill up. Classification must thus, for the most part (whatever view is taken of evolution), depend upon the laws deducible from ANATOMY, EMBRYOLOGY, PHYSIOLOGY, and DISTRIBUTION OF ANIMALS. All that is proposed on the subject in this article is a very simple and general outline of the characters of the greater divisions, leaving further details for notice under various headings.

On the animal kingdom there are seven great divisions, or *subkingdoms*: VERTEBRATA, MOLLUSCA, ARTHROPODA, VERMES, ECHINODERMATA, CELENTERATA, and PROTOZOA. It must be remembered that these and other divisions of living beings are not precisely defined, and that the characters given for each will not apply in their entirety to every individual in that division. The Vertebrates, which include FISHES, AMPHIBIA, REPTILES, BIRDS, and MAMMALIA, are distinguished from the rest of the animal kingdom (the Invertebrata of Lamarck) by having a spinal column. This consists of a tube which in the adult is more or less bony (*vertebral column*), inclosing a mass of nerves constituting the brain and spinal cord. There is also another nervous system, the "sympathetic," which regulates the action of the heart, and other organs whose functions are independent of the will. The limbs of Vertebrates are in two pairs, which appear in various forms, as fins, wings, arms, legs, &c., or may dwindle down to a mere indication as in the slow-worm, or may disappear as in snakes. They are turned away from the nervous system, and are attached to an internal skeleton by means of muscles. Nutrition is necessary not only for growth,

but to make up for waste of the tissues. Just as a steam-engine exerts force at the expense of material burned, and as part of this material passes away as waste, so in the animal body heat and force are generated, and waste matters are produced, by a like process of burning. To provide for this growth and waste, food is digested into a fluid which is taken up by minute tubes and carried to the blood-vessels to supply the wants of the blood—the builder up of the body. The blood is carried to all parts, nourishing the tissues, and taking away the products of their wasting. The blood circulates by means of arteries and veins, the motion being kept up by the rhythmical contractions of a muscular organ, the *heart*. *Respiration*, the process of supplying the blood with oxygen, is effected by distinct breathing organs, either lungs or gills.

The second subkingdom is the *MOLLESCA*. Their soft (Latin, *mollis*) bodies are generally covered with a shell, and hence the popular name "shell-fish." The digestive cavity is completely shut off from the interior of the body. The heart, in the higher Mollusca, has two chambers; in the Tunicata (sea-squirts) it is a simple tube; in the Polyzoa (e.g. sea-mats) there is no heart, and the circulation is effected by *cilia* (microscopic hairs which lash backwards and forwards). The nervous system of the higher forms is made up of three nerve-knots (*ganglia*), one above the gullet, another in the "foot," and another placed posteriorly, and these are joined together by nerve-fibres; in the lower forms there is but one nerve-knot. Respiration is effected by one or two gills (*branchie*) on each side.

The third subkingdom, *ARTHROPODA* (insects, crabs, &c.), have *feet*, or legs, *jointed* to the body. (Gr. *arthron*, a joint; *pous*, *podos*, a foot.) The typical arrangement of the parts of the body is a series of rings placed one behind the other. The digestive canal is shut off from the rest of the body. The nervous system consists typically of a pair of nerve-knots in each ring, united by nerve-cords.

The fourth subkingdom, *VERMES* (worms), is composed of animals which have a long soft body, with two symmetrical sides. When feet are present they are not jointed to the body. *Vermes* generally possess a distinct digestive cavity, a nervous system, and a remarkable system of tubes called the "water-vascular system," which does not assist in locomotion, as in the next subkingdom. Many are parasites, and in all the organs of sense are very simple.

The *ECHINODERMATA* (star-fishes, sea-urchins, &c.) have a body which is more or less star-shaped. The skin is hardened by secreting carbonate of lime, and is generally covered with prickles. (Gr. *echinos*, a hedgehog; *derma*, skin.) The water-vascular system assists in locomotion. The digestive canal is distinct from the body; the nervous system simple, consisting of a ring round the gullet, with numerous rays going to all parts of the body.

The *CILENTERATA*, the sixth subkingdom, is composed of animals (e.g. hydra, sea-anemone, corals) whose digestive cavity opens into the body-cavity. (Gr. *kailos*, hollow; *enteron*, bowel.) The vital fluid, or "blood," does not circulate by means of veins and arteries. In most no nervous system can be found. The body is made up of an outer and an inner layer; and in most members of this subkingdom there exist peculiar stinging organs, called "thread-cells."

The seventh and last subkingdom, *PROTOZOA*, contains the lowest forms of animal life. (Gr. *protos*, first; *zoo*, life.) The protoplasm does not develop true layers. There is no nervous system, and no body-cavity.

ANIMAL CHEMISTRY investigates the chemical elements and combinations which go to make up the body; the composition of the necessary food-stuffs; the chemical changes which take place in the elaboration of food into tissues, &c.; and the nature of secretions and excretions.

The chemical nature of the processes which do not follow the regular course—that is, of those which take place in disease—forms a part of this inquiry. Thus, pathological as well as physiological chemistry are branches of animal chemistry.

The chemical elements found in the human body are carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, calcium, sodium, potassium, iron, chlorine, fluorine, magnesium, and silicon. Combinations of the first four, united sometimes with sulphur and potassium, form what are known as *proximate principles*. These may be arranged in three groups—(1) those containing nitrogen, the *PROTEIDS*; (2) *FATS*; (3) *AMYLOIDS*. The following mineral substances, formed by combinations of chemical elements, are the principal that are found:—Carbonate of lime, phosphate of lime, and fluoride of calcium, in the bones and teeth—the two latter also in small quantities in some tissues; chloride of calcium (common salt) throughout the body; iron, in the colouring matter of the blood, in the hair, and other tissues. From the continual waste going on in the tissues there result carbonic acid, ammonia, and water. See *FOOD*, *DIGESTION*, *ABSORPTION*, *NUTRITION*, *SECRETION*, *EXCRETION*, *RESPIRATION*.

ANIMAL HEAT is caused by a slow combustion in the body. As a steam-engine produces heat and motion, together with waste products, through the chemical union of the carbon of the fuel with the oxygen of the air, so in the capillary vessels all over the body chemical changes are taking place; oxygen is uniting with the food, digested and elaborated, and producing heat and contraction of the muscles (*i.e.* motion), giving off the waste products, carbonic acid, water, &c., and uric acid. Amyloids (sugar, starch, &c.) and fats are the heat-producers; but the latter are the most efficient, as they contain a large quantity of surplus hydrogen, in addition to carbon, ready to be burned off. This accounts for the liking of the Esquimaux for oil and blubber. In fish, amphibia, and reptiles the heart does not provide for that complete separation of the oxidized from the unoxidized blood which obtains in birds and mammals; and as a consequence of this less complete oxidation, less heat is generated in the cold-blooded vertebrates. Every motion of the body necessitates a new chemical combination. Thus respiration increases with activity, and the heat is proportionate to the increased respiration. Children and those who take plenty of exercise are warmer than the aged and the sedentary. Insects that are constantly on the wing are capable of producing much heat. Mr. Newport (*Phil. Transact.*) quotes in illustration a case of the mean temperature of a bee-hive during May being 90° Fahr., while the atmosphere averaged only 60°; and during the swarming season the thermometer rose as high as 96° or 98°—10° above the surrounding air. The temperature of birds is higher than mammals, and varies with rapidity of flight; in the gull it is 100° Fahr., while it rises to 112° in the swallow. In man the temperature varies between 97° and 101° Fahr. Animal heat is affected by external circumstances, and if reduced or elevated beyond certain limits death ensues. Terrestrial animals are exposed to much greater changes of temperature than those living in water, and are therefore provided with special means of resistance. In regions where the winters are very cold birds are protected by downy feathers, other animals by fur or wool, thus preventing more heat escaping than the body can readily produce. Moreover, at the approach of the Arctic winter this covering turns white, which allows still less heat to radiate. Whales and other water mammals, being warm-blooded, are protected by an enormous thickness of fat or blubber, which is a bad conductor of heat. Man, by judicious clothing, can guard against cold, and can increase the production of heat by muscular

exertion and by including in his diet a large proportion of fats. To withstand an excess of heat a special apparatus exists in the perspiratory glands. [See PERSPIRATION.] The water thus carried off, insensibly by EVAPORATION, or sensibly in the form of drops, renders latent (or absorbs) a large amount of heat; men while working at furnaces lose in weight, but do not become much hotter. Animals that live in water have no pores of this kind, for, in the first place, there are no sudden changes of temperature, and secondly, water readily carries off any excess of heat produced in the body.

ANIMALCULES, in zoology, is the name given to minute animals of various classes, which require the aid of the microscope in order to be seen distinctly. See PROTOZOA, ROTIFERA.

ANIMISM is the name first used by Dr. E. B. Tylor ("Primitive Culture" and "Anthropology") for the "theory of souls," or "the principle out of which arose the various systems of spirits and deities in barbaric and ancient religions."

Savage races explain natural events by supposing that they are caused by the agency of spirits, and if the view is accepted that savages represent generally the state of man in prehistoric times, then this animistic philosophy is the first ever cultivated. It would probably arise from the notion of a human soul, and Dr. Tylor ascribes this belief in a soul to the different appearances presented by animals, living and dead, asleep or awake, and to dreams, when persons appear in shadowy, unsubstantial forms. A human soul conceived, it would follow that souls would be assigned to the lower animals, and in a certain sense even to lifeless objects, since these also come and go in dreams. The horse and weapons of the Red Indian are buried by his side for life use in the land of spirits; and a survival of this custom exists in our own land in the ceremony of leading a soldier's horse at his funeral. From these beginnings are traced the belief that all the powers of nature are endowed with spirit; and hence the rise of the various religions. From the theistic stand-point much of this will be granted—"The invisible things of Him from the creation of the world are clearly seen, being understood by the things that are made, even His eternal power and Godhead" (Rom. i. 20).

ANIMUCCIA GIOVANNI, a musical composer, the inventor of oratorio. He was born at Florence about 1500, and died at Rome, where he was predecessor of Palestrina as maestro at the Vatican in 1571. Animuccia had studied under the Huguenot Claudio Goudimel, and was an accomplished master in his day, though afterwards quite overshadowed by the fame of the immortal Palestrina. He gained the friendship of St. Filippo Neri, and with him hit upon the idea of attracting youths to sacred things by an interesting musical religious service of a somewhat dramatic character, performed after the ordinary office in the oratory of the future saint. From this purely Catholic source grew up our oratorio, now so exclusively a Protestant form of music.

ANISE (*Pimpinella Anisum*) is a plant belonging to the natural order UMBELLIFERÆ. It is indigenous in Egypt and the islands of the Aegean Sea, but is cultivated in many parts of Europe. The fruit (aniseed) is extensively employed as a condiment, as a carminative medicine, and for the purpose of flavouring liquors.

The word *anthon* of Matt. xxiii. 23, has been translated "anise," but it more probably refers, as Dr. Boyle says, to the common dill (*Anethum graveolens*), which also belongs to the Umbelliferae, and is used for the same purposes as anise.

Star or Chinese anise (*Illicium anisatum*) belongs to the MAGNOLIACEÆ. This shrub is a native of China. The star-shaped fruit is largely exported to neighbouring

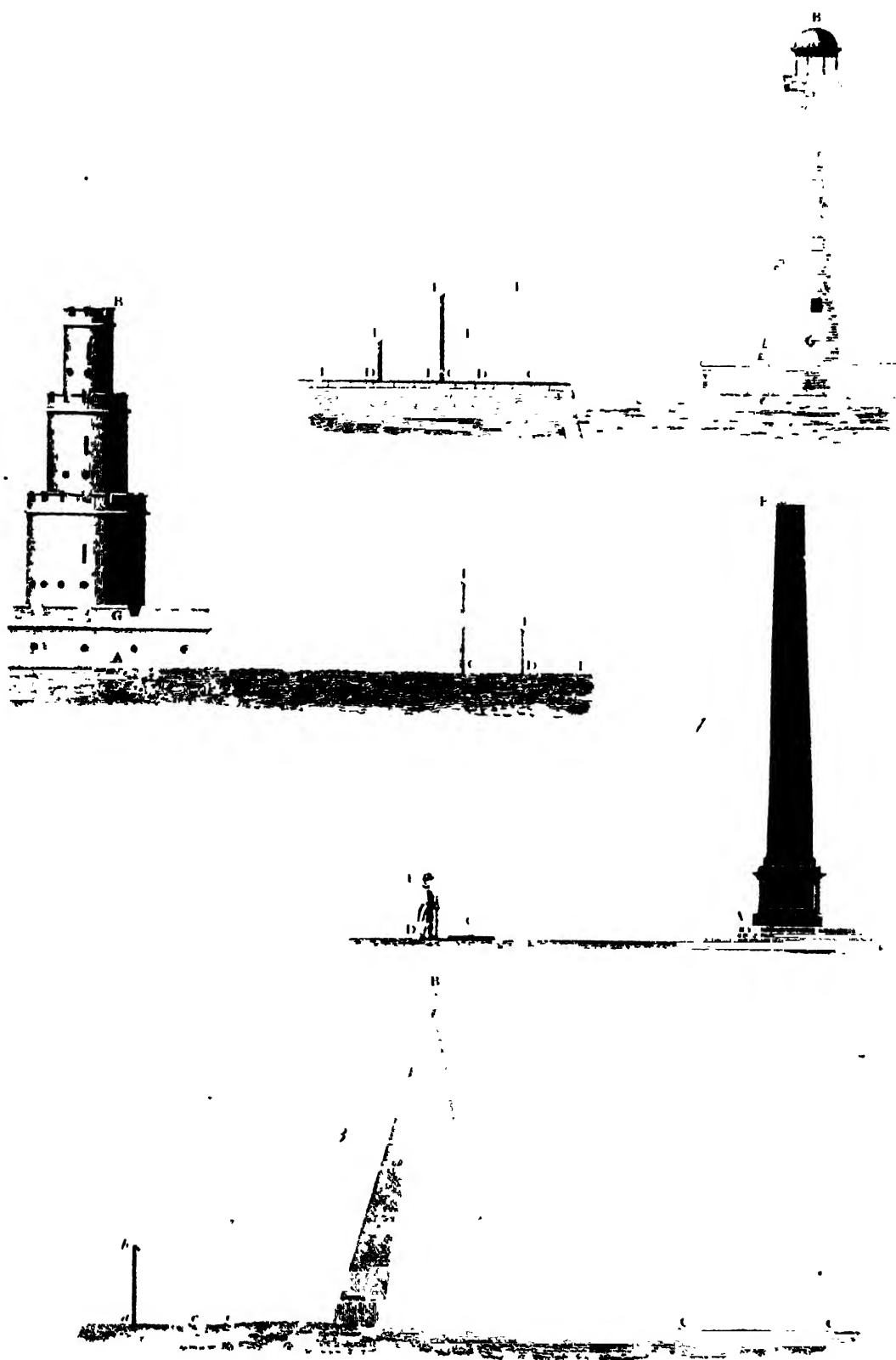
countries, and throughout Asia is used both by cooks and doctors, as it possesses much the same properties as the Pimpinella. *Illicium religiosum* of Japan is a sacred tree with the natives. The bark is used as incense in the temples, and wreaths are made of it to lay on the graves of their dead.

ANJAE, the chief town of a district of the same name in the native state of Cutch, in Hindustan. The town is built on the side of a hill, about 10 miles from the Gulf of Cutch. It was almost destroyed in 1819 by a severe earthquake. Both the town and district were ceded to the English in 1816 by the chief of Cutch, for assistance rendered him. By a later arrangement, in 1822, the territory was restored on the condition of a yearly money payment, which being found too heavy a burden was in 1832 entirely remitted. The soil is sandy, and the water supply is derived from wells. Population of the town, 13,000.

ANJOU, one of the provinces or military governments into which France was divided before the revolution of 1789. It is nearly coincident with the department of MAINE-ET-LOIRE, and that part of INDRE-ET-LOIRE which is west of Tours. Its capital was ANGERS. The former inhabitants were known to the Romans as *Audegari*.

ANJOU, COUNTS AND DUKES OF, were amongst the earliest noblesse of France. Some chronicler gives the title to the famous Roland. Charles the Bald, it is said, bestowed the province in 870 upon one of his courtiers, from whom the first family of counts were descended. A count of Anjou, named Fulke, joined the early crusades, and became king of Jerusalem. His son Geoffrey married (in 1127) Matilda, or Maud, daughter and heiress of King Henry I. of England; and Henry Plantagenet, their son, eventually came to the crown as Henry II., the first of the Angevin kings of England. Thus merged the first house of Anjou.

Soon after the conquest of the province by the French in the thirteenth century, it was bequeathed by Louis VIII. (in 1226) to his fourth son, Charles of Anjou, who commenced the second house of Anjou. He espoused the daughter of Raymond Berenger, last count of Provence, and through her inherited that extensive fief, including the greater part of the south of France. His government of Provence was marked by rapacity, overbearing cruelty, and contempt for the privileges of his subjects. He was, however, selected by the pope for the throne of Naples, in opposition to Manfred and Conradin, the last of the Hohenstauffen. He invaded Italy in 1266, and in the following year a battle was fought near Benevento, in which he was victorious, and after slaughtering his prisoners and sacking the town, he entered Naples in triumph. As head of the Guelphic (papal) party he next marched into Tuscany; and after a series of battles with the Ghibellines (imperialists), in which he displayed considerable ability and great cruelty, he extended his influence, until he reigned not only over Naples, but over the whole of Italy. Regarding the murder, for it was none other, of the noble young Conradin, heir to the kingdom of Naples, by Charles of Anjou, when, trying to escape after Tagliacozzo, he was captured and brought to Naples, Milman says ("Lat. Christianity," xi. 3)—"Christendom heard with horror that the royal brother of St. Louis (Louis IX. of France), that the champion of the church, after a mock trial, had condemned the last heir of the Swabian house—a rival king who had fought gallantly for his hereditary throne—to be executed as a felon and a rebel on a public scaffold. It was said that Robert of Flanders, the brother of Charles, struck dead the judge who had presumed to read the iniquitous sentence. The inexorable Charles would not permit the body to be interred in consecrated ground."





Sand Lance



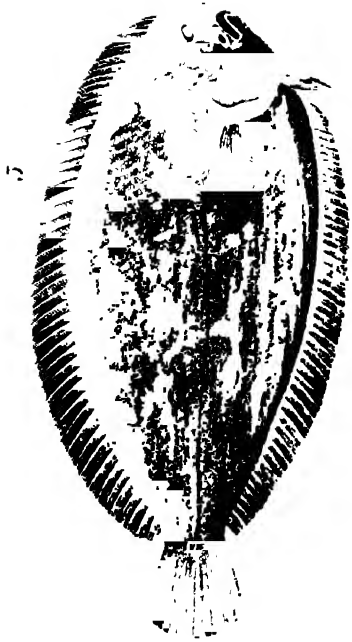
Veleatus unimaculatus



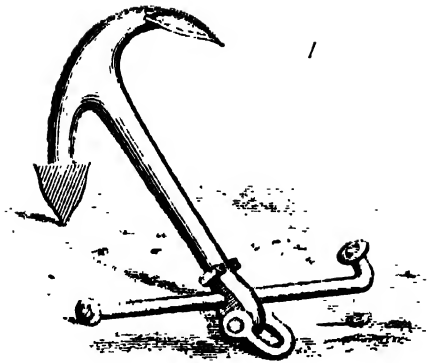
Whai



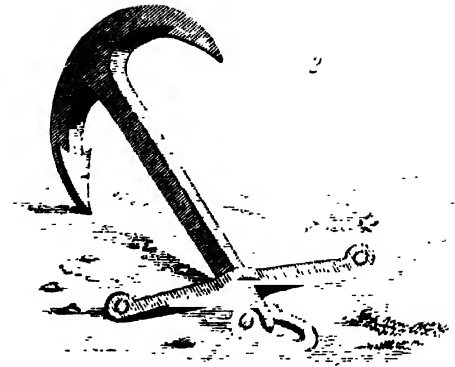
Common Flounder



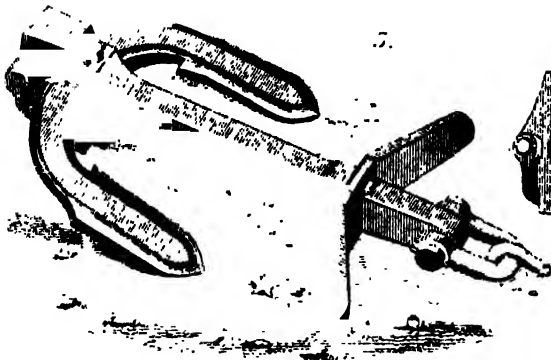
Common Sole



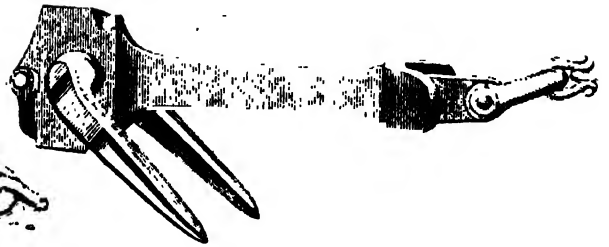
Admiralty Anchor



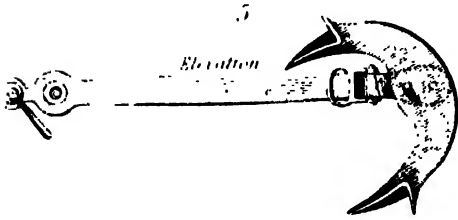
Rodgers Anchor



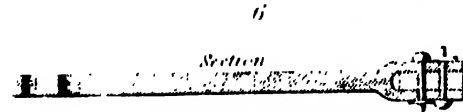
*Martin's Anchor
Position previous to taking hold*



*Martin's Anchor
Embedded in the ground*

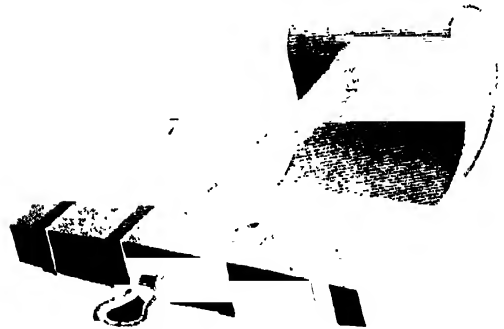


Elevation

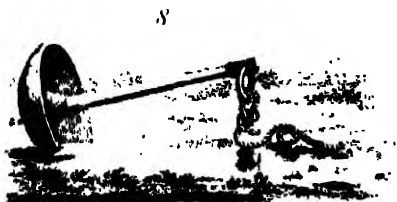


Section

Trotman's Anchor



Mooring Anchor



Mushroom Anchor.



Buoy Mooring Block.



Grapple.



1 Phantom Minnow



2 Tattler Minnow

SALMON FLIES



3 Caddis



7 Black Scot



8 Pennell's Pattern
(all of bodies)



5 March Brown



6 May Fly

TROUT FLIES



11 Grey Drake



10 Stone Fly



12 Brown Molt



13 Red Spinner



14 Black Gnat



15 Willow Fly



16 Whirling Dun

9 Brown Palmer





Loxia stricklandi



Echypetes agilis



Phaeton phaeocephalus



Fulmarus glacialis *Fulmar Petrel.*



Fulmarus glacialis *Fulmar Petrel.*



Fratercula arctica *Pomarine Skuas.*



Rhyncops nigra *Black Skimmer.*

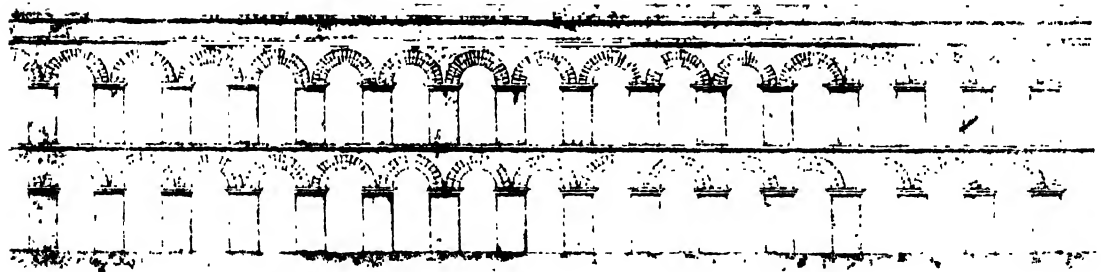


Rhyncops nigra *Black Skimmer.*

AQUEDUCTS.



AQUA CLAUDIA

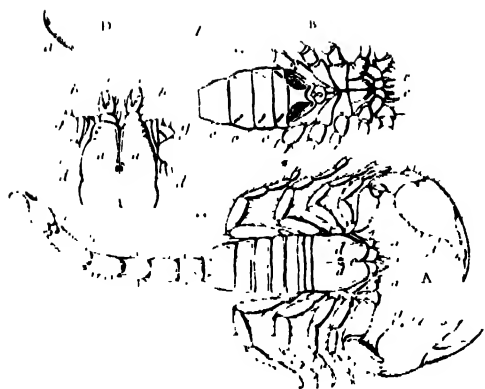


THE CAMPAGNA OF ROME.

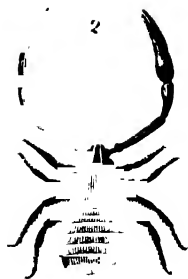


AT METZ ON THE MOSELLE.

ARACHNIDA.



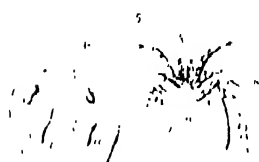
Scorpio Linn.



Scorpio Linn.



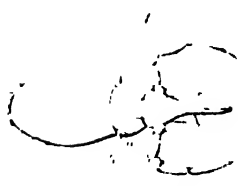
Epigynum
tarantula Spiders



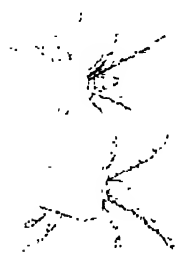
Hydromys at *Hydromys*



Aranea *aranea*
Aranea Spiders



Scorpio *dephala*



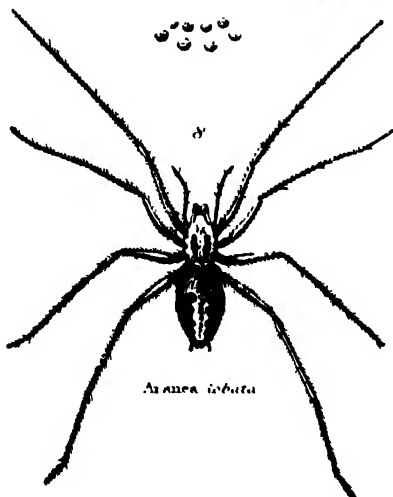
Aranea *dephala*



Aranea *dephala*
Aranea



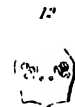
Aranea *dephala*



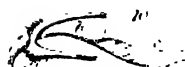
Aranea *dephala*



Aranea *dephala*
Chinese *Mite*

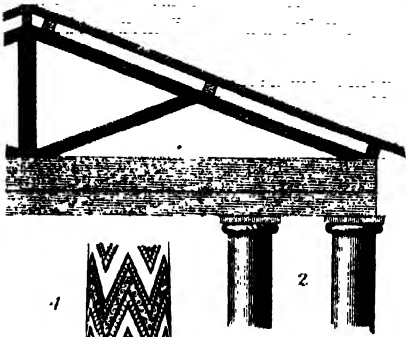


Pholcus *phalmarum*

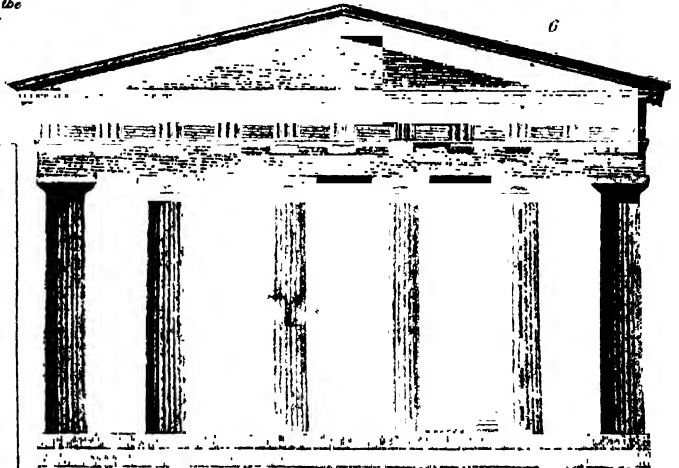
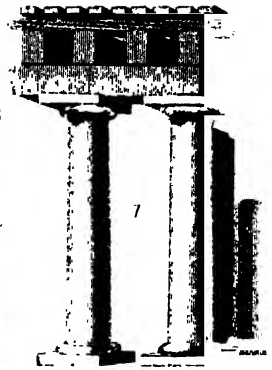
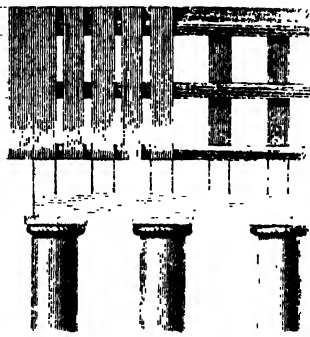


Tegenaria *dephala*
House *Spider*

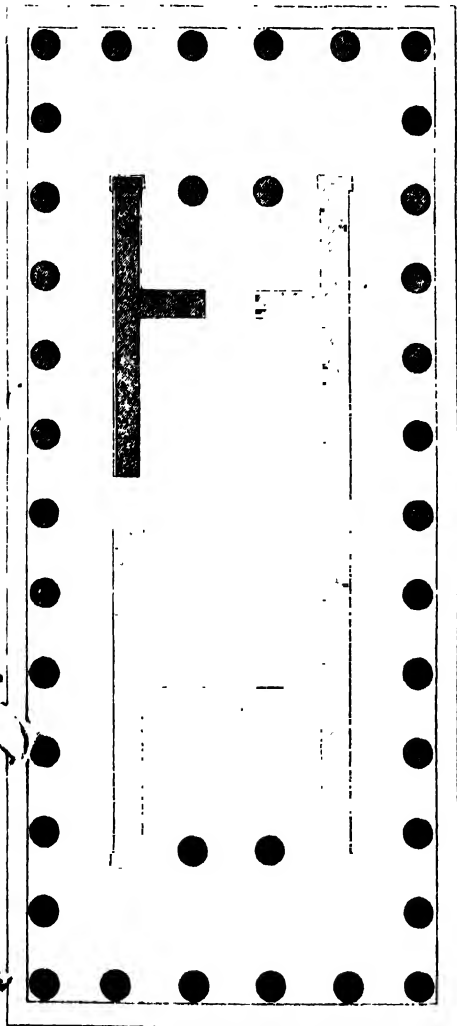
ARCHITECTURE.



Fragment of a Column found near the entrance of the treasury of Athens



Elevation of the temple of Theseus



Plan of the temple of Theseus at Athens

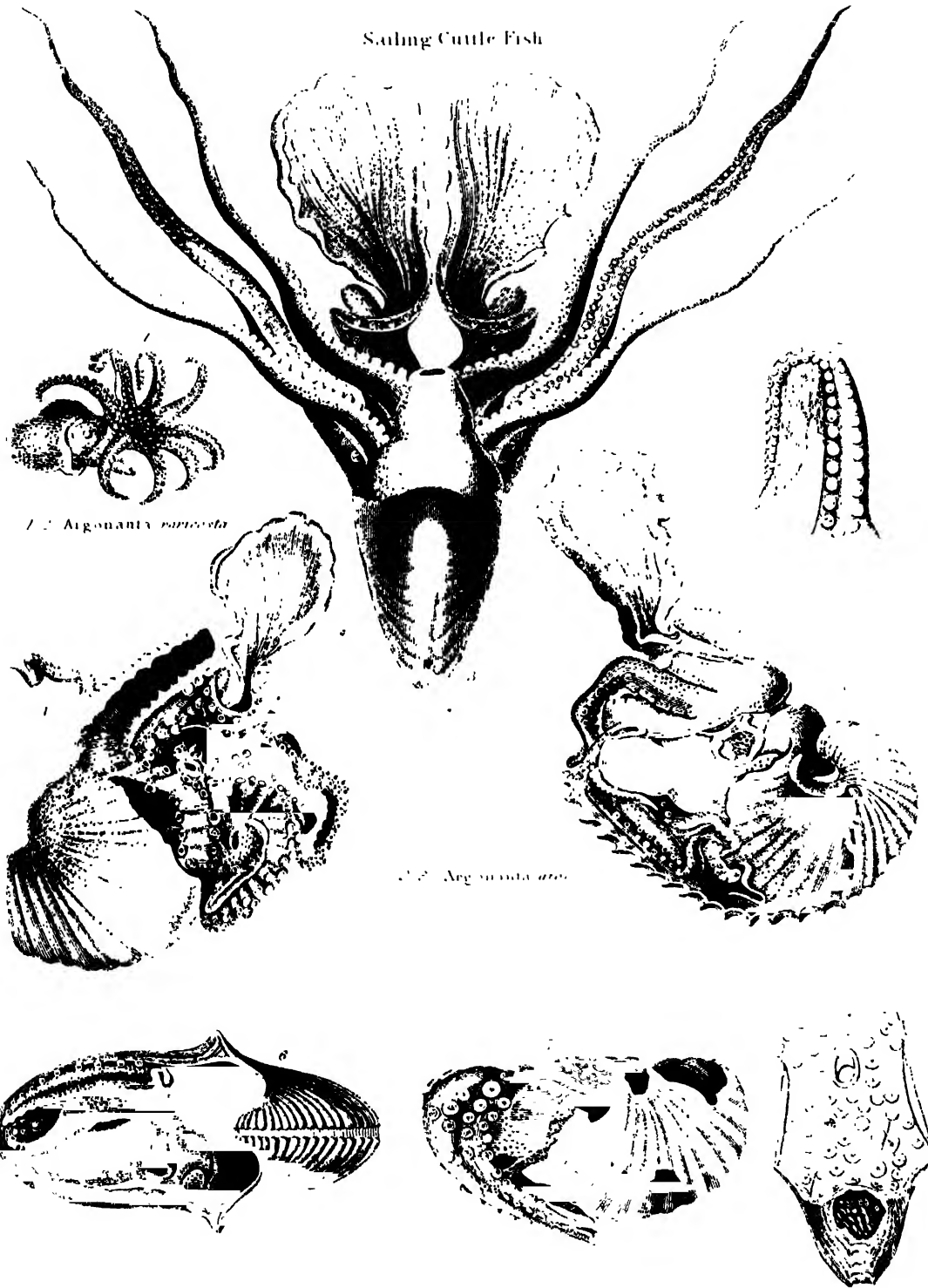


Entrance to the treasury of Athens.

0 10 20 30 40 feet

ARGONAUT

Sailing Cuttle Fish



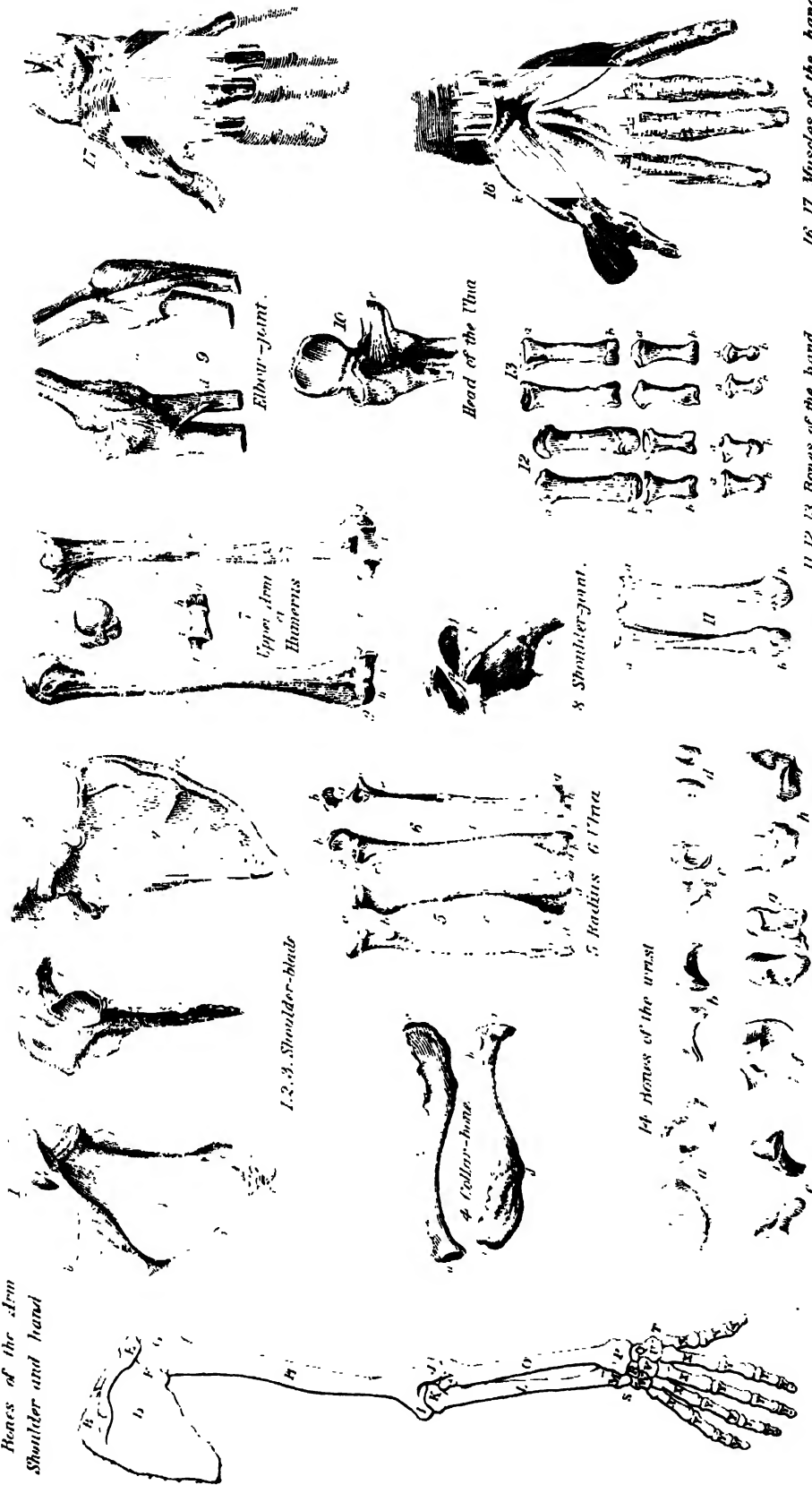
1. 2. *Argonauta parvula*

3. 4. *Argonauta arborescens*

1. The animal out of the shell. 2. the front arm, showing the dilatation. 3. the animal expanded, showing the 8 arms, the anterior pair being dilated at the end. 4. the sides of the body marked by the ribs of the shell. 5. the animal partly contracted. 6. the animal quite contracted in the shell. 7, 8. the side & top view of the animal partly contracted in its shell, the shell broken at the beak to show the Eggs.

(INCLUDING SHOULDER AND HAND)

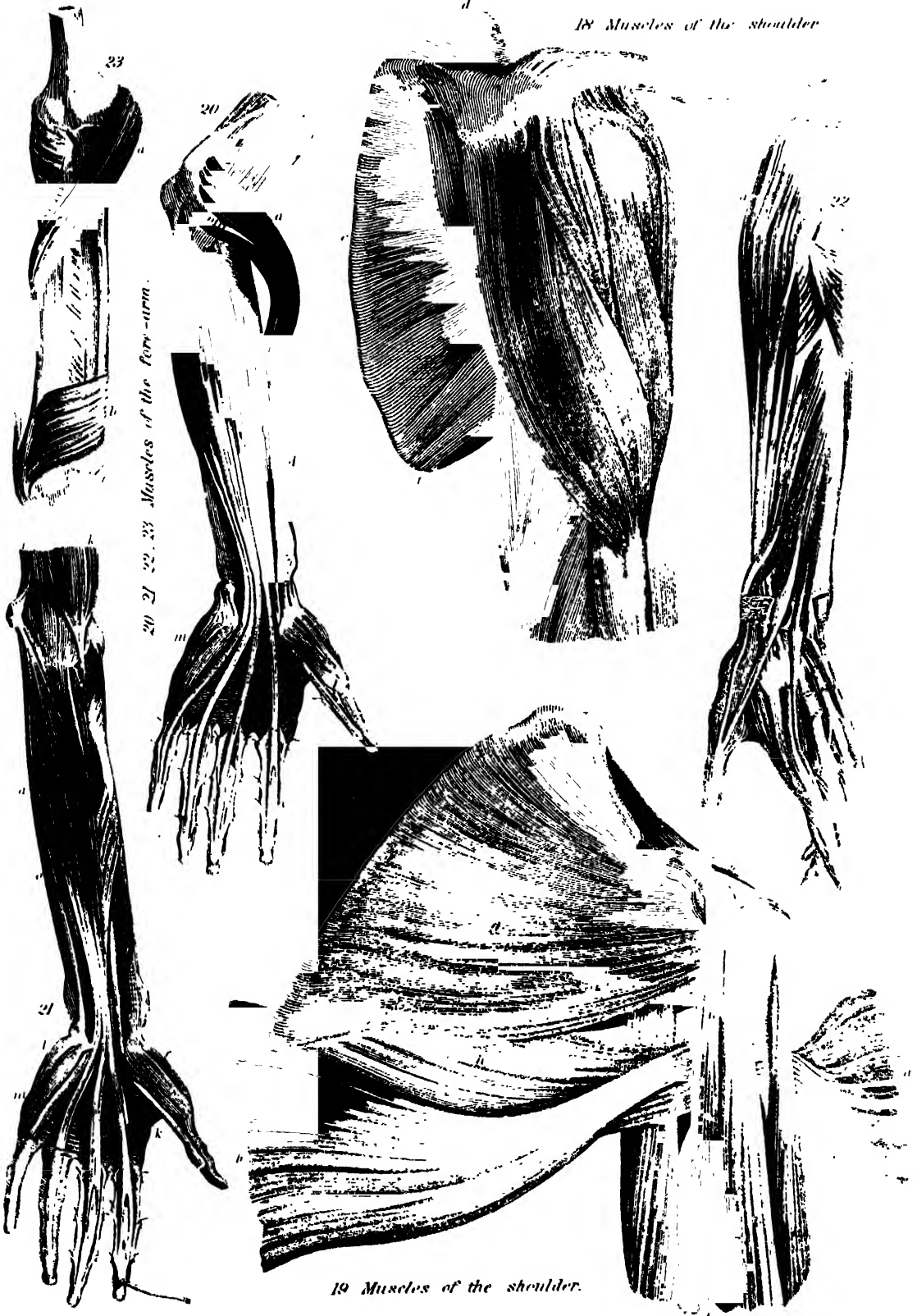
Bones of the Arm
Shoulder and hand

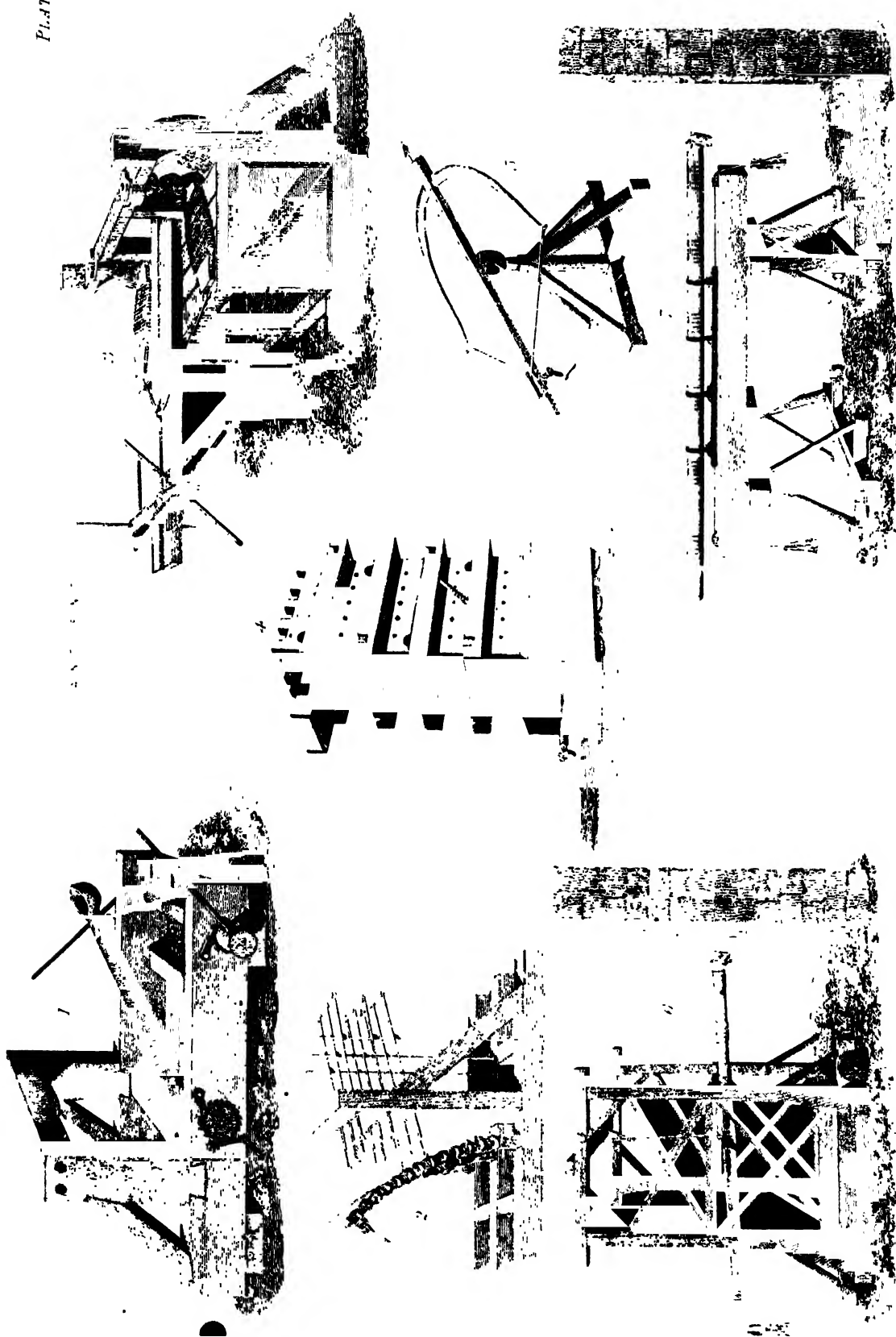


(INCLUDING SHOULDER AND HAND)

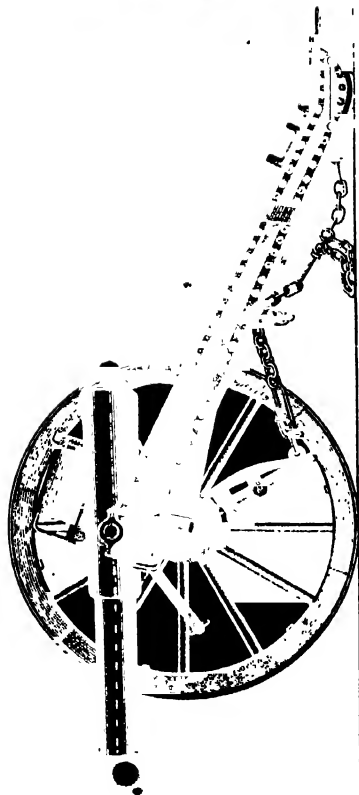
d

18 Muscles of the shoulder

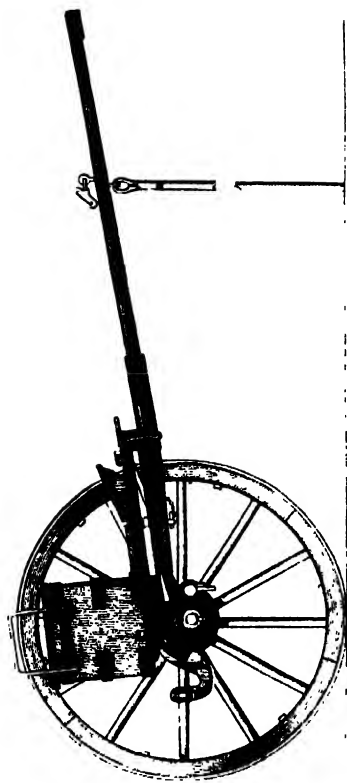




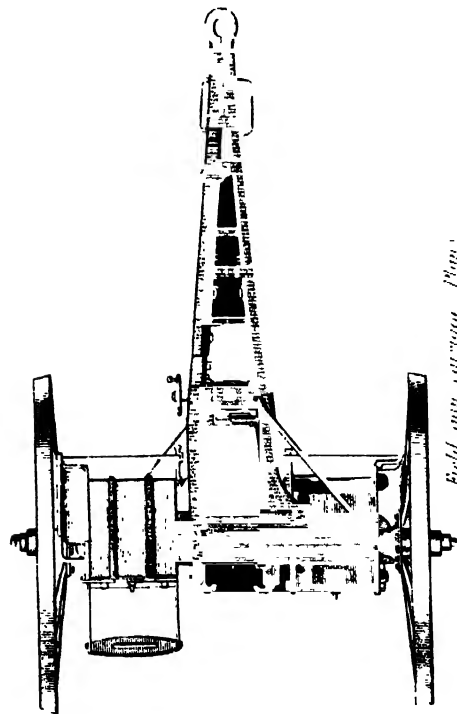
MOFFET (BRITISH) FIELD ARTILLERY.



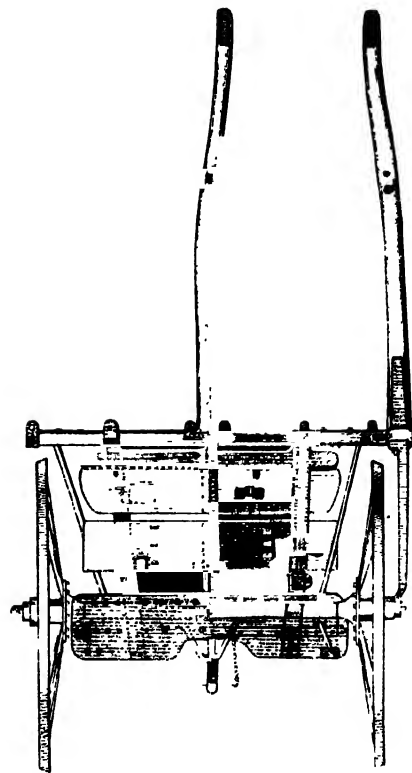
Field gun and carriage with and without



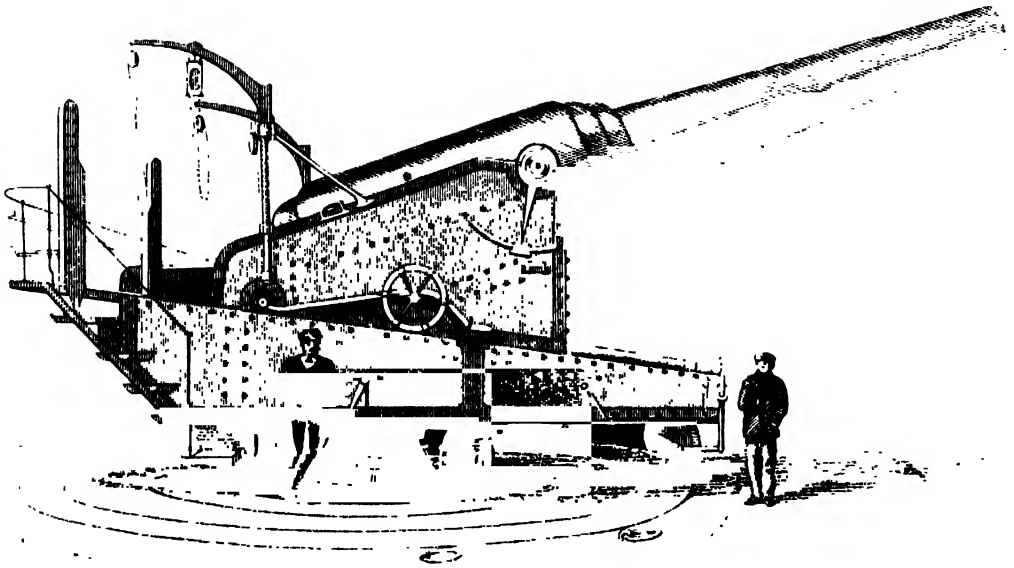
Limber without carriage



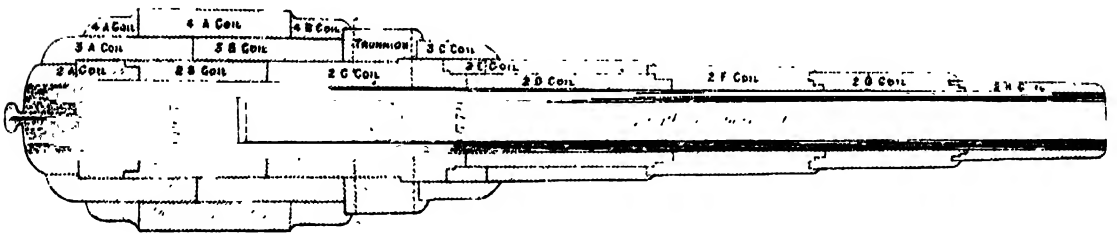
Field gun carriage Plan



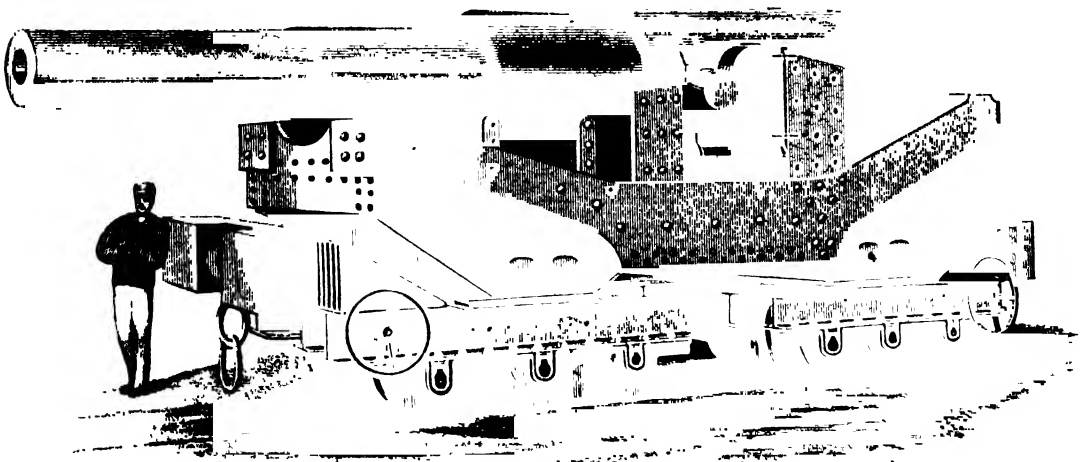
Limber Plan



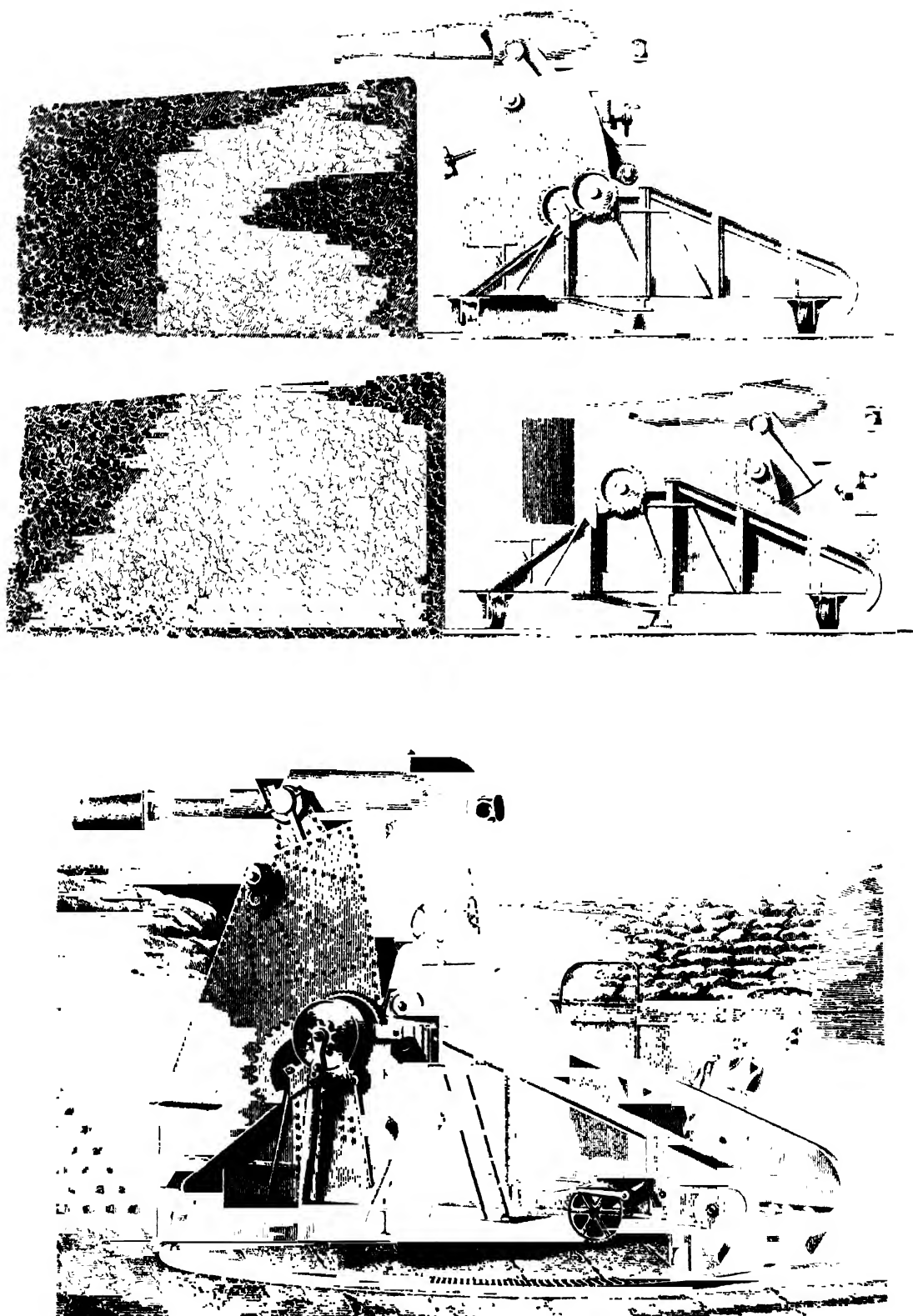
1. Armstrong 10-ton



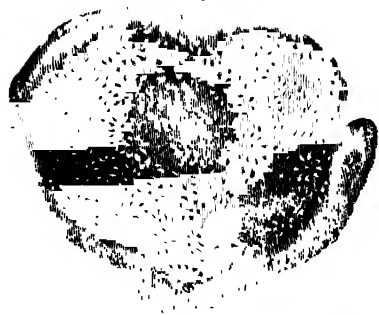
2. Section of Armstrong 10-ton gun



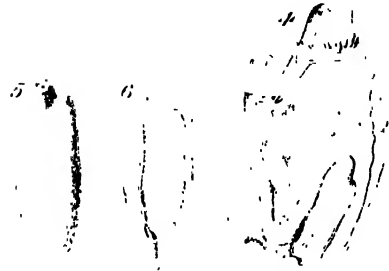
3. Woolwich 81-ton Gun.



MONCRIEFF GUN CARRIAGE



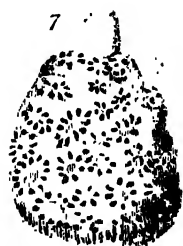
1 - *Distoma tubum* Sav



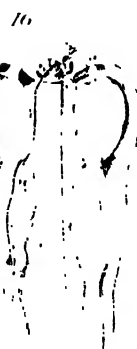
Cynthia canopus



Cynthia mentis Sav



7 & *Botryllus polyceratus*



20 - *Sagittaria australis*

5 & *Clavelina borealis*



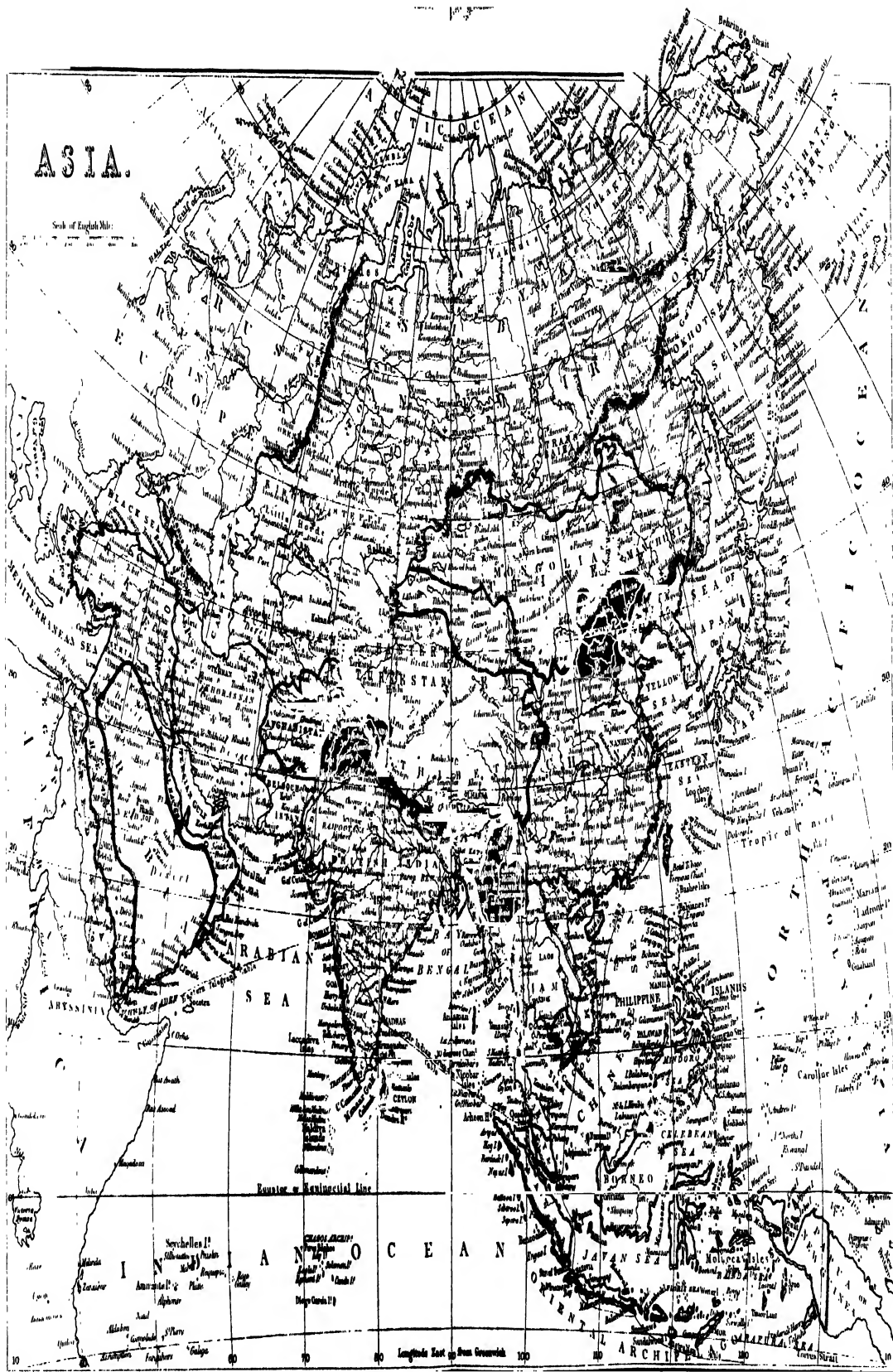
15 17 *Synonema rogersi*



12, 11 *Polychinum constellation*

ASIA.

Scale of English Miles.

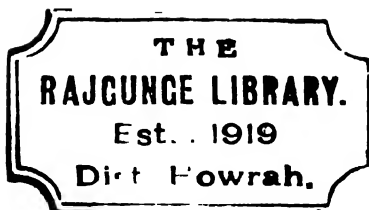


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First-Class Subscribers

NATIONAL ENCYCLOPÆDIA

A DICTIONARY OF

UNIVERSAL KNOWLEDGE.

A.

A, the first letter of the alphabet in the English language, and in many others. As a sound, its power in English is at least fourfold, as in the words *father*, *call*, *tame*, and *hat*. The first of these sounds is that which generally prevails in other languages. The modified pronunciation of the vowel in *tame* is partly due to the vowel *e* at the end of the word; in *call* and similar forms the peculiarity arises from the letter *l*; so that the only true sounds of the vowel are perhaps the long sound in *father*, and the short one in *hat*.

The letter *a* is the most easily pronounced of the vowels, requiring neither the retraction of the lips like *i* (= *ee* in feet), nor their propulsion as in *u* (= *oo*).

1. *A* is readily interchanged with *o*. This is common between the German and English, as *kalt*, *cold*; *alt*, *old*; *falt*, *fold*. 2. *A* is also interchanged with *e*. Thus the Romans generally used an *a* in those German names which now begin with *e*, as *Albis*, *Elbe*; *Amisia*, *Ems*. 3. *A* is interchangeable with *i*. This is limited to the short vowels, as in the Greek negative prefix *a-*, contrasted with the Latin *in*, and the Latin *sine* with the French *sans*. [See I.] 4. *Au* is interchangeable with *o*. [See O.] 5. *Äi* is interchangeable with *a*, as in the Latin *lact*, *lactuca*, *factus*, *fumes*, *pauis*, compared with the French *lait*, *laitue*, *faït*, *faïm*, *pain*. So the Latin *amas*, *amamus*, *amatis*, are contracted from *amais*, *amainus*, *amaitis*. 6. *Äe* is interchangeable with *a*, as the ablative *musa* from *musæ*, the imperative *ama* from *amare*.

A or **AN**, the indefinite article. *A* is used before a consonant, *an* before a vowel. Thus we say *an emperor*, *a king*. Sometimes a virtual consonant exists at the beginning of a word without being written, as in *union* and *once*, which are pronounced with the initial sounds of *y* and *w*, *yunion* and *wonce*. Before such words it is customary to drop the final letter of the article, at least in pronunciation, and there can be no good reason for not writing *a union*, *a once beloved monarch*. On the other hand, whenever *h* is mute, we should retain the *n* both in writing and speaking; thus, *a history*, but *an historical work*. That *an* and not *a* is the primitive form of the article, is proved by the Anglo-Saxon *an* and the German *ein*; indeed our own numeral *one* is only another and fuller form of the same word. In such phrases as *three shillings a pound*, the article evidently has this meaning. In some of the best modern grammars the term article is discarded, and *a* or *an* are described as numeral adjectives. The double shape of our article has led to a corrupt mode of writing certain words; thus from *an eft* was deduced *a neft*, *a nevt*. The letter *a* often appears prefixed to nouns, so as to constitute a kind of adverb, as *afoot*, *aside*, *aboard*,

now-a-days, &c. These, as Horne Tooke observes, are all abbreviations of *on fide*, *on eye*, *on borde*, *now-on-days*, &c., which thus occur in our old English poets. This *on* is an Anglo-Saxon preposition with the meaning of *in*. In many words now in use, the *a* in the beginning takes the place of *on*. *Alive*, for instance, means *on life*, *i.e.* in life. "So he fell asleep," in the old translation of the New Testament is, *he fell on sleep*. The *a* formerly often prefixed to our participles in *ing*, both in the active and passive sense, as *the house is a-preparing*, *he has gone a-walking*, has the same origin.

A 1 is used in "Lloyd's Register of British and Foreign Shipping," to denote that a vessel entitled to that appellation is of first-class character, and her anchors, cables, and stores in an efficient state for the conveyance of passengers and all kinds of goods. The title is, therefore, conferred on those vessels only which are new, or (in the case of wood vessels) have been "continued" or efficiently "restored." From the edition of the "Register" for 1885 it appears, that the letters used to designate lower classes of wood vessels are *A* in red, *Æ*, and *E*. Surveyors from Lloyd's Register periodically inspect all such vessels, and, according to their reports, the committee, not the surveyors, arrange them in the different classes. The '*A* in red' include wood ships which have passed the period assigned in the original survey, and also ships not having had an original character, which are found on survey to be of a superior description, and fit for the conveyance of dry and perishable goods to and from all parts of the world. Ships of the *Æ* class are those fit for the conveyance of such goods for shorter voyages; of the *E*, those suitable for conveying cargoes not in their nature subject to sea damage on any voyage. The figure 1 affixed to the character indicates efficiency of equipment, chain cables, anchors, rigging, &c.


Timber-built vessels, and those with iron frames and wood planking (termed composite ships), are classed for terms of years according to the ordinary durability of the woods used, and some minor conditions. The terms assigned to these vessels are indicated by prefixes to the *A 1*, as 14 *A 1*.

Vessels built of iron, being more durable, hold their classification continuously upon periodical surveys. The difference in their construction is designated by the prefix of 100, 95, and so on down to 75, to the *A 1*, as 100 *A 1*.

The term *A 1* has now become a common expression, synonymous with perfect or excellent, and passes current in conversation by the whole of the English-speaking race.

A in music. The note we now call *A* was the keynote or *mesé* of the Hypodorian mode in ancient Greek music. This was the favourite mode of the ancients and

consequently the earliest organs were made to begin on its key-note; for this reason, and also because the note written

as A at the bottom of our present bass stave, 

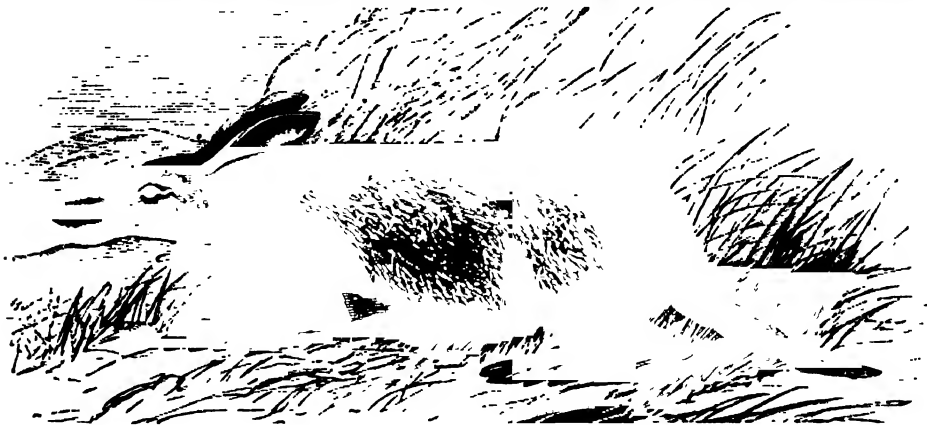
was the lowest note in the ancient Greek system, it came to be regarded as the first note in music. It was not expressed in the Greek systems by the letter A. The Greeks called the key-note of any mode *mesé* (μῆσῃ), or *middle string*, and other notes of the mode were grouped round the *mesé*, bearing names corresponding to the higher or lower strings by which they were produced on the lyre: much as in our own day the tonic sol-fa system has only one nomenclature for every key, describing not the actual note (as in the ordinary notation), but only its relation to the key-note. The Romans, later on, named the fifteen notes of the Greek two-octave scale by the first fifteen letters of the alphabet (A to P); and it is traditionally ascribed to St. Gregory (A.D. 590), that he further simplified the system by using the first seven only (A to G), repeating them for the upper octave, as at present.

Thus A was first the name of the lowest note, or key-note, of any mode, and then became limited to the name of

the lowest note on the organ, the key-note of the Hypodorian mode. In this manner the common ancient Greek scale has been preserved, and may be played on the white notes of the pianoforte from A to A. It will be found to differ widely from any scale in present use. It would be described as our key of A minor with a flat seventh. For the changes which made C instead of A the principal note, and the key of C (all white notes) instead of the Greek key of A (all white notes) the principal key in music, see SCALE.

AA, the name of several small rivers, five of which belong to Germany, five to Switzerland, three to Flanders, one to Russia in Europe, and one to France. The French Aa, one of the largest of these rivers, belongs to the department of PAS DE CALAIS.

AALBORG (*pron.* öl'borg), the principal town of Aalborg Amt, in North Jutland, is situated on the south side of the channel of the Lümfiord, about 15 miles from its junction with the Cattegat. The harbour admits vessels drawing 10 feet of water, and has a considerable trade in grain and herrings. There are manufactures of soap, sugar, leather, and tobacco. The town is the seat of a Lutheran bishop, and has a cathedral and a very large diocesan library.



The Aard-vark.

There is also a school of navigation. The population in 1882 was 12,000. Aalborg means Eel-town, a name derived from the large number of eels found in the vicinity.

AAR, the principal branch of the Rhine in Switzerland. See AARGAU.

AARAU, the capital of the canton of Aargau, in Switzerland, is agreeably situated at the foot of the Jura Mountains, on the east bank of the Aar, 42 miles N.E. of Bern. It has manufactures of silk, cotton, leather, cutlery, and mathematical instruments. Population, 6066.

AARD-VARK, Earth-Pig, or Cape Ant-eater (*Orycteropus capensis*) is found in South Africa. It is allied to the Hairy ANT-EATERS of South America, the PANGOLINS or Sealy Ant-eaters of Asia and Africa, and more remotely to the SLOTHS and ARMADILLOS—the whole group forming the order EDENTATA.

The aard-vark is distinguished from the other ant-eaters by the possession of teeth, but these are of very simple structure, five on each side of both jaws, and none in front. The body is about 4 feet long, stoutly built, and but scantily covered with brownish, bristly hairs. The muzzle is slender and hog-like, with a small mouth; the tongue is long and flat, covered with slimy saliva; the eyes are small; and the ears erect, large, and pointed. The legs are short; the feet long and placed flat on the ground; the toes—four on each front foot, and five on each hind one—are armed with hoof-like claws, well adapted for bur-

rowing. The tail is not quite half the length of the body—gradually tapering from a thick base.

The food of the aard-vark consists of ants, and termites or "white ants;" and wherever the high, mound-like nests of the latter are to be seen on the plains of South Africa, there the traveller has to be careful lest his horses or wagons should meet with an accident from the extensive burrows of the ant-eater. At night, when all is still, the timid creature may be seen warily venturing from its burrow, where it has been sleeping during the day. It makes its way to the nearest ant-hill, and with its strong claws quickly tears a hole in the hard outer crust, puts in its snout, and feeds on the ants by means of its long slimy tongue. If disturbed it easily makes its escape, as it can burrow faster than a man can dig. It grows very fat, and is thought good food by the settlers.

Two other species of *Orycteropus* are known—*Orycteropus senegalensis* in Senegal, and *Orycteropus athiopicus* in Southern Nubia.

The fossil bones of an extinct ant-eater have been found in the miocene deposits of France. The animal was of great size, partaking to some extent of the structure of both pangolin and aard-vark; it has been named the *Macrotherium*.

AARD-WOLF (*Proteles Lalandi*), or Earth-wolf of the Dutch colonists of the Cape. The genus *Proteles* appears to be an intermediate link between the HYENAS

and Civets; it contains only one species, which is a native of South Africa. In general form and appearance the aard-wolf greatly resembles the hyæna, excepting that it is very much smaller than any species of those animals; nevertheless, as in them, the hinder quarters are low and trailing, the shoulders thick and muscular, while a full coarse mane runs along the spine, so that at first sight the animal might be taken for a young striped hyæna, the more so as it closely resembles that animal in the colours and markings of the fur. It differs from the hyæna in having five toes instead of four on each foot. In the form of the head, and in its dentition, it more nearly approaches the civet.

The aard-wolf is nocturnal in its habits, and constructs

a subterranean burrow, at the bottom of which it lies concealed during the day-time, only venturing abroad during the night. It is partially gregarious, several individuals being the tenants of the same burrow, which has usually three or four distinct entrances, in order to facilitate escape under circumstances of danger. Notwithstanding the trailing of the hind quarters, the aard-wolf runs with considerable quickness; when irritated it erects its mane like the hyæna; in its disposition it is very wary and cautious. Its food consists of carrion and small animals, not excluding ants.

AARGAU (French, *Argovie*), one of the twenty-two Swiss cantons. On the north the Rhine separates it from the grand-duchy of Baden; the canton of Bâle



The Aar Falls at Handeck.

bounds it on the west, that of Zurich on the east, and that of Lucerne on the south. It takes its name from the river Aar, which rises in the glaciers of the Grimsel, which form the southern limits of the canton of Bern; and after flowing through the lakes of Brienz and Thun, and past the towns of Bern, Soleure, and Aarau, falls into the Rhine on the south bank, about 14 miles above Laufenburg. The whole length of its course is nearly 200 miles. Near Handeck, on the route from Meiringen to the Rhone Glacier, the Aar forms the Handeck Falls, and precipitates itself, in an unbroken mass, into an abyss 250 feet in depth. Next to the Tosa and Rhine Falls this is the most imposing cascade in the Alps.

The canton of Aargau is a pleasant and, in many parts, a fertile district, diversified by hills, mountains, and valleys. It is partly traversed by the chain of the Jura Mountains,

but they hardly attain the height of 3000 feet; in fact, the canton is the least mountainous in Switzerland. The land is fertile and well cultivated, and there are extensive vineyards. The chief manufactures are cotton, silk, and hosiery. The area is about 538 square miles, and the number of inhabitants in 1881 was 198,645. German is the language in general use. The canton contains the castle of Habsburg, or Hapsburg, the former seat of the present imperial family of Austria.

AARHUS, the principal town of Jutland, is situated on the east coast, at the mouth of the Mölle-Aa. It is tolerably well built, is the seat of a bishop, and has the largest cathedral in Denmark. There are manufactures of spirits, leather, cottons, woollens, and tobacco, and also some extensive fisheries. The harbour is small, but safe and convenient. The population in 1882 was

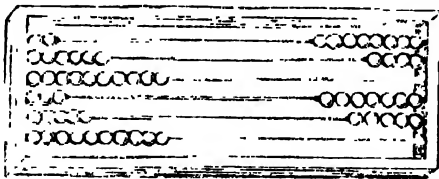
16,000. The first Christian church in Denmark was built at Aarhuus.

AARON, the first high-priest of the Jews, son of Amram, of the tribe of Levi, and the elder brother, by three years, of Moses. Though inferior in ability and force of character to his younger brother, he was a man of ready speech, and assisted Moses in guiding and controlling the Israelites in their journey from Egypt to Canaan. Left in charge of the people while Moses was on Mount Sinai receiving the Law, he yielded to their demand for an image to worship, and out of their golden ornaments made them an idol in the shape of a calf, in imitation of the Egyptian images of the god Apis or Mnevis. For this act he was sternly reprov'd by Moses, and the people were severely punished. Notwithstanding this weakness, he was soon afterwards set apart, with his sons, to minister in the priests' office, which was made hereditary in his family. He sustained this office until his death, which took place in the year 1451 B.C.—the fortieth year of the wilderness journey. The interesting circumstances of his death are recorded in Num. xx. 23-29. The word Aaron is probably of Hebrew origin, signifying "Enlightened," and is the same as Hurin, so common in the East.

A'BACA, or Manila Hemp, is the fibre of *Musa textilis*, a native of the Philippine Isles. The leaf-stalks are split into long strips, and the fibrous part is then separated from the fleshy pulp and manufactured into ropes for naval and other purposes. They lack flexibility, but are exceedingly durable. Some of the finer kinds of fibre are woven into shawls. See *MUSA*, HEMP.

A'BACUS, in architecture, is the level tablet, whether square or oblong, which is almost always formed on the moulded or otherwise enriched capital of a column, to support the horizontal entablature.

A BACUS, the name given by the Greeks to an instrument employed to facilitate arithmetical calculations. It consists of a frame, traversed by stiff wires, on which beads or counters are strung so as to move easily. It is seldom used in England, except in infant schools, where it is generally employed in teaching elementary arithmetic. It



was largely used both by the Greeks and Romans, and is still general in China and further India. In the above form the beads on the top right-hand row are units; those on the next, tens; and so on. Thus, as it stands, the number 57,918 is represented upon the right-hand side.

ABANDONMENT is a term used in marine insurance to express the abandoning or surrendering of a ship or goods insured, to the insurer. It is a principle of English law that the insurer has the right to abandon and to compel the insurers to pay the full value of the thing insured in every case "where, by the happening of any of the perils or misfortunes insured against, the voyage is lost, or not worth pursuing, and the projected adventure is frustrated; or where the thing insured is so damaged and spoiled as to be of little or no value to the owner; or where the salvage is very high; or where what is saved is of less value than the freight; or where further expense is necessary, and the insurer will not undertake to pay that expense" (Marshall on the "Law of Insurance"). As the contract of insurance is one of indemnity, the insurer is at liberty to abandon or not, as he thinks proper; but if

he gives notice of abandonment it is irrevocable, and the value of the ship or goods is retained by the underwriter. In some countries the time is fixed by law within which the insured, after being informed of his loss, must elect either to abandon or not; but in England no particular period is fixed—the rule being that notice of abandonment must be given within a reasonable time, any unnecessary delay being regarded as intimating the insurer's intention not to abandon. The effect of an abandonment is to make the owners trustees for the underwriters; and the captain and crew of the vessel are bound to exert themselves to the utmost to save as much property as possible, and, in turn, are entitled either to full wages and remuneration from the insurers, or to so much as the value of the goods saved will justify.

See Justice Park on "Law of Insurance," Arnold on "Marine Insurance," and Maude and Pollock's "Law of Merchant Shipping."

Abandonment in railway law signifies the permission given by the Board of Trade to a company, on certain conditions, to relinquish the making, maintaining, or working of a railway, or portion of a railway, for which parliamentary powers had been obtained and conditions undertaken.

ABATEMENT, a term derived from the old French word *abater*, which signified to beat down, prostrate, or destroy. In law it is used (1) to signify the remedy allowed to a person unlawfully annoyed or injured of destroying or removing that which gives offence, provided that he commits no breach of the peace, nor does more injury to the thing than is necessary for effecting his purpose; and in the event of any public nuisance, such as a gate or fence placed across a public road or path, the right of any person to peaceably remove it; (2) in freehold property, when a stranger takes possession without a title, and keeps the heir or devisee out of possession; (3) in legacies, when, owing to insufficiency of funds, the full amount cannot be paid, and when therefore a proportionate abatement has to be made; (4) in actions, when it can be shown that there is something which renders it the duty of the court to put an end to the proceedings, or that there is a defect in form or personal incompetency of the parties suing.

Abatement or *Rebate*, in commerce, are terms used to signify a discount allowed for prompt payment: the difference in value between an immature bill and the same instrument arrived at maturity; and the difference in interest allowed by bankers when loans which have been taken for a specified term are paid off by permission at an earlier date. It was also formerly employed to signify an allowance occasionally made by the customs authorities from the duties charged upon such goods as were damaged, but no abatement was ever allowed upon the goods which are now liable to duty; and the term has in this sense become obsolete.

Abatement, in heraldry, is a mark placed over part of a family coat of arms, to signify that the wearer has been guilty of an unworthy act. In some works on this subject several such marks are distinguished, but they are altogether repudiated by many authorities.

ABATIS, in the military art, is a number of felled trees, having the smaller branches only cut off, which are placed side by side, with their trunks towards the defenders. An abatis serves as an obstacle to the advance of an enemy, being in front of a line of troops, and frequently between redoubts of earth formed at intervals; it is also disposed about a weak part of a field-work, in or beyond its ditch, for a like purpose. The trees are fastened to the ground, and the approach to them should be defended by a flanking fire from collateral works.

ABATTOIR, the name given by the French to the public slaughter-houses which were established in Paris,

by a decree of Napoleon, in 1810, and finished in 1818. There were three on the north side of Paris, and two on the south side, not far from the barriers, and about 2 miles from the centre of the city. A general abattoir, on a very extensive and improved scale, and at a greater distance from the city, has since been constructed, and other towns in France have erected abattoirs. An inspector is appointed at each abattoir, and means are taken to prevent unwholesome meat being sold. The manufacture of glue, gelatine, Prussian blue, hoof oil, blood manure, and other chemicals produced from offal, are conveniently placed near the abattoirs, and trips are also made within the establishments. There are slaughter-houses under public regulations in nearly all Continental cities; and those of New York and Philadelphia, and most other of the cities of the American Union, are placed on a similar footing.

The great cattle-market in Smithfield, for the supply of London, existed above five centuries; but the spot was originally a piece of waste ground beyond the city, instead of being, as at present, surrounded by a dense population. In 1855 it was removed to Copenhagen Fields, where there are two public slaughter-houses, but large numbers of cattle and sheep are still driven through the crowded streets of the metropolis to be killed at private slaughter-houses. Since 1855 these have been licensed by the magistrates, and their occupiers have been compelled to conform to certain regulations.

By the Metropolitan Building Act, passed in 1844, it was provided that in 1874 the killing of animals for food in private slaughter-houses should cease in London. In 1873, however, a select committee of the House of Commons recommended that they should be allowed to be continued, but that their diminution should be accelerated by the construction of slaughter-houses attached to public markets. The 37 & 38 Vict. c. 67, passed in 1874, prohibited the establishment of any slaughter-house without the sanction of the local authority, which is empowered to inspect and make orders and by-laws for their regulation. The abattoir at the foreign cattle market, at Deptford, is probably the most complete building of the kind in the world.

ABAUZIT, FIRMIN, a French scholar, was born at Uzès in Languedoc in 1679. His parents were Protestants in good circumstances; and after the revocation of the Edict of Nantes he was enabled to escape, by his mother's contrivance, from the hands of the authorities, who wished to educate him in Catholicism, and was sent to Geneva. Here he prosecuted his studies with such intense ardour that he made considerable progress in almost every branch of human knowledge. In 1698 he visited Germany, Holland, France, and England, but returned again to Geneva, where he spent the remainder of his life. He enjoyed the esteem and friendship of the most distinguished men of the age in which he lived, Sir Isaac Newton, Picoche, Voltaire, Rousseau, and many others, having expressed the highest admiration of his extensive acquirements and extraordinary power of memory. He declined the offer of the chair of philosophy, which was made to him in 1723; but in 1726 he accepted the post of honorary librarian to the city of his adoption. He died 20th March, 1767, in his eighty-eighth year. His published works are few and unimportant. He contributed some theological, historical, and scientific articles to the "Journal Helvétique," and wrote several papers for Rousseau's "Dictionary of Music." He also edited Spon's "History of Geneva," and rendered valuable assistance to a society which had been formed for translating the New Testament into French. One of his essays, disputing the canonical authority of the Apocalypse, excited much attention at the time, but it was conclusively answered by Dr. Leonard Twells. His religious opinions were Unitarian, and at his death his heirs, who were Roman Catholics, destroyed the greater part of his papers. A

collection of his writings was published at Geneva in 1770, and an imperfect edition in London in 1773.

ABBA, the emphatic Chaldee form of the Hebrew word *ab*, signifying father. It was expressive of love, confidence, and submission, and its use was only permitted to members of the family, being forbidden to servants and slaves. It occurs three times in the New Testament, Mark xiv. 36, Rom. viii. 15, and Gal. iv. 6.

ABBA'S I., king of Persia, seventh of the Sufi dynasty, commonly called Shah Abbas the Great, was born in 1557. He was youngest son of Mohammed Mirza, but obtained possession of the throne at the age of eighteen, after heading the nobles in a successful rebellion against his father, and causing his elder brother to be assassinated. He was possessed of remarkable talents and great energy of character; and after protracted conflicts with the Uzbeks, who had occupied Khorassan, and with the Turks and Tartars who had taken a large portion of Persian territory in the west, he succeeded in regaining all the provinces that had been lost, and at the time of his death his kingdom extended from the Tigris to the Indus. He introduced many reforms in the internal government of Persia, and protected the mercantile establishments which had been founded by the English, French, and Dutch at Gombroon; but, assisted by the East India Company, he attacked the settlement of the Portuguese on the island of Ormuz, and took possession of it on 22nd April. 1622. He endeavoured to protect his subjects from the tyranny of subordinate officials, but in his own affairs he was jealous and savagely cruel. All his sons became victims to his suspicions—the eldest being put to death, and the eyes of the others put out. He died in 1628, and was succeeded by his grandson, Shah Sufi.

ABBASIDES, a Moslem dynasty which succeeded the Omniyades in the caliphate in the year 750 A.D. and retained it until 1250 A.D. The name of this family is derived from their ancestor Abbas-ben-Abd-al-Motaleb, a paternal uncle of the prophet Mohammed. The first of the family to obtain recognition as caliph was Abul Abbas, surnamed Al-Saffah or the Blood-shedder, who ascended the throne in A.D. 750, but died after a reign of three years, and was succeeded by his brother Al-Mansur (753–774), who removed the seat of government from Damascus to Bagdad. It was at this city that the caliphate enjoyed its greatest splendour, and it was during the reign of two members of this family, Harun-al-Rashid, grandson of Al-Mansur (786–809), and his son Mamun (813–833), that the Arabic empire reached its highest point of prosperity. The epoch of Harun's reign has, in the remembrance of Mohammedan nations, become the golden age of their dominion, and the wealth, luxury, and splendour of the court of Bagdad at this period are exhibited in many of the stories of the "Arabian Nights." Flourishing towns sprung up in every part of the empire, traffic by land and sea increased, and Bagdad rivalled even Constantinople in magnificence. His son Mamun is even more worthily celebrated for the encouragement he gave to science and literature. During his reign he founded colleges and libraries in the principal towns of his dominions, and caused works on astronomy, mathematics, metaphysics, natural philosophy, and medicine, to be translated from the Sanscrit and Greek into Arabic. The wealth and luxury of the empire proved fatal to its power, and the closing period of the reign of Mamun was troubled by successful rebellions in the west, and disturbances in the north and east. To strengthen himself against his rebellious subjects, Motasim (833–842), the brother and successor of Mamun, formed regiments of Turkish youths and appointed them his body-guard, and these, during the reign of his successors, became to the caliphate what the Prætorian guard had been to the Roman emperors. The family continued to hold the

caliphate during the next two centuries, but over a gradually diminishing empire, and after the reign of Rhadi (934-940) with merely nominal power. Province after province became independent, until only Bagdad and the surrounding district remained; and in A.D. 1257 Mostasem, the last of the line, was slain by the Tartar Hulaku, who took Bagdad, pillaged it for seven days, burnt it, and put an end to the government of the Abbasides.

ABBÉ is the French term for Abbot, and originally signified the ruler of a monastery, but by a concordat between Pope Leo X. and Francis I. (1516) the king obtained the right to nominate 225 abbés, commendataires who, without having any duty to perform, drew about one-third of the revenues of the various monasteries to which they were nominated. The result was the formation of a class of men whose connection with the offices of the church was of the slenderest character, but who occupied a very conspicuous place in French society. Many of them acted as tutors in private families, others were professors at the universities, and a great many employed themselves as men of letters. On the other hand, many were merely parasites of the wealthy and titled families, and were often of very indifferent character. After the middle of the sixteenth century the title was bestowed upon all young ecclesiastics, whether in office or not.

ABBEOKOUTA, a large city of Western Central Africa, and capital of the Egba nation, is situated in lat. 7° 8' N., lon. 3° 20' E., on the river Ogoon, about 80 miles N. of Lagos. It is in reality a collection of small towns and villages, and its population is 150,000. Its situation is very pleasant, and it is surrounded by a wall of hardened mud, 18 or 20 miles in circumference. The town has been, and still is, the scene of devoted missionary labours, and human sacrifices and the slave trade have been abolished; but the progress of the country has been hindered by frequent wars with the king of Dahomey. The chief trade is in palm oil and grain.

ABBESS, the superior of a nunnery or other female religious community. An abbess, in the Roman Catholic Church, possesses in general the same dignity and authority as an abbot, except that she cannot exercise the spiritual functions appertaining to the priesthood. An abbess, for example, cannot confess her nuns, although it appears that in ancient times she was allowed to do so; but that practice was suppressed. According to a decree of the Council of Trent, it is recommended that an abbess, at the time of her election, should be at least forty years old, and have made profession for eight years; and it is forbidden that any person be elected to the dignity who has not been professed for five years, or is under thirty years of age.

ABBEVILLE, a city in the N. of France, in the department of Somme, is situated on the river of that name, in a valley of great beauty. It is a place of considerable trade, and has various manufactures, which include velvets, cottons, serges, barracans, &c., linen and bed-ticking. Dyeing and bleaching are also carried on. The Somme, at high water, is navigable up to the town for vessels of 300 tons. The population of the town in 1882 was 20,000. Abbeville is fortified, and has five gates. The houses are generally of brick, but there are in its narrow streets some interesting structures of old timber. The west front and a portion of the nave of the cathedral of St. Wolfran are part of a magnificent design never completed; the façade is a splendid example of the flamboyant Gothic. Abbeville is 25 miles N.W. from Amiens, and 120 N.W. from Paris. It is celebrated from the traces of primeval man found in the river gravel of the neighbourhood, which throw back the chronology of the human period to a very remote antiquity. Henry III. met Louis IX. at Abbeville in 1259, and con-

cluded a peace, by the terms of which he renounced his claim to Normandy and other provinces.

ABBEY (from the French *abbaye*), a religious community presided over by an abbot or abbess. When the superior was denominated a Prior, the establishment was called a Priory; but in later times there was no real distinction between a priory and an abbey. The priories appear to have been all originally off-shoots from certain abbeys, to which they continued for some time to be regarded as subordinate. After visitations of inquiry, Henry VIII. suppressed some small monasteries in 1525, and again in 1536; and all religious houses throughout the realm were suppressed by Parliament in 1589-40. Tanner gives the number as 186 large monasteries, with a revenue of £104,919; 374 lesser ones, with a revenue of £33,479; and 48 houses of the knights-hospitaliers, with a revenue of £2385. See **MONASTERY**.

The terms abbey and priory are now commonly applied to the buildings formerly occupied by the religious communities.

In the early time of the French monarchy the term abbey was applied to a duchy or earldom, as well as to a religious establishment.

ABBOT, the title of the superior of certain establishments of religious persons of the male sex, called abbeys. The word *abbot*, or *abbat* as it has been sometimes written, comes from *abbatis*, the genitive of *abbas*, which is the Greek and Latin form of the Syriac *abba*, of which the original is the Hebrew *ab*, father. It is, therefore, merely an epithet of respect, and appears to have been at first applied to any member of the clerical order, just as the French "père" and the English "father," which have the same signification, still are in the Roman Catholic Church. In the earliest age of monastic institutions, however, the monks were not priests; they were merely holy persons who retired from the world to live in common, and the abbot was one of their number whom they chose to preside over the association. The general regulations for monasteries, monks, and abbots (*hegumenoi*) of the Emperor Justinian, in the sixth century, are contained in the "Novellæ," which form a part of the "Corpus Juris." In regard to general ecclesiastical discipline, all these communities were at this time subject to the bishop of the diocese, and even to the pastor of the parochial district within which they were established. At length it began to be usual for the abbot, or, as he was called in the Greek Church, the archimandrite (that is, the chief monk) or the hegumenos (that is, the leader), to be in orders; and since the sixth century monks generally have been priests. In dignity an abbot is considered to stand next to a bishop, but there have been many abbots in different countries who have claimed almost an equality in rank with the episcopal order. In England, according to Coke, there used to be twenty-six abbots and two priors, who were lords of Parliament, and sat in the House of Peers. These, sometimes designated sovereigns or general abbots, wore the mitre (though not exactly the same in fashion with that of the bishops), carried the crozier (but in their right hands, while the bishops carried theirs in their left), and assumed the episcopal style of lord. Some croziered abbots, again, were not mitred; and others who were mitred were not croziered. Abbots who presided over establishments which had sent out several branches, were styled cardinal-abbots. There were likewise in Germany prince-abbots as well as prince-bishops. In early times we read of field-abbots (in Latin, *abbates milites*) and abbot-counts (*abba-comites* or *abbi-comites*). These were secular persons, upon whom the prince had bestowed certain abbeys, for which they were obliged to render military service as for common fiefs. A remnant of this practice appears to have subsisted in our

own country long after it had been discontinued on the Continent. Thus, in Scotland, James Stuart, the natural son of James V., more celebrated as the Regent Murray, was, at the time of the Reformation, prior of St. Andrews, although a secular person. And the secularization of some of the German ecclesiastical dignities has since occasioned something like a renewal of the ancient usage. In modern times a prince of the house of Brunswick (the Duke of York) was at the same time commander-in-chief of the British army and bishop of Osnabrück. The efforts of the abbots to throw off the authority of the diocesans long disturbed the church, and called forth severe denunciations from several of the early councils. Some abbays, however, obtained special charters, which recognized their independence, a boon which, although acquired at first with the consent of the bishop, was usually defended against his successors with the most jealous punctiliousness. Many of the abbots lived in the enjoyment of great power and state. In ancient times they possessed nearly absolute authority in their monasteries. Of the religious orders founded after the eleventh century, only some named the superiors of their monasteries abbots; most, from humility or other cause, used the titles of prior, major, guardian, or rector.

ABBOT, GEORGE, Archbishop of Canterbury, was born at Guildford, in Surrey, 29th October, 1562, and was the son of a cloth-worker. After passing through the grammar-school of his native town, he proceeded to Balliol College, Oxford, in 1578. In 1583 he entered into holy orders; in 1593 he took the degree of B.D., and in 1597 that of D.D., in which year he was also elected Master of University College. After this he was three times appointed Vice-chancellor of the University. In 1599 Abbot was promoted to the deanery of Winchester, and in 1604 he was appointed, with seven other Oxford divines, to translate part of the New Testament. In 1608 he was made chaplain to the Earl of Dunbar, and attracted the notice of King James I. by his earnest efforts to bring about a union between the churches of England and Scotland, to obtain which the earl had been intrusted with a mission to Scotland. Promotion rapidly followed, and in December, 1609, he was appointed Bishop of Lichfield and Coventry, was translated to the see of London in the following February, and little more than a month afterwards was elevated to the archbishopric of Canterbury. In 1622, while hunting, he accidentally shot one of the keepers with an arrow, which caused the man's death within an hour. A clamour having been raised against him by his enemies, a commission was appointed by the king to examine into the question whether this involuntary homicide incapacitated him from the duties of his office. Their decision was favourable to Abbot, and he retained his office until his death, which took place at Croydon, 5th August, 1633. He was buried in the church of his native town of Guildford, where a monument is erected to his memory. Abbot belonged to the Puritan party in the church, and strenuously opposed the efforts of Laud and his followers on the one hand, and the doctrines of Arminianism on the other. He was the author of a geographical work entitled, "A Brief Description of the Whole World," which passed through several editions; and a number of theological works, one of which, the "Exposition on the Prophet Jonah," was reprinted in 1845.

His brother, Robert Abbot, was raised to the see of Salisbury in 1615, but died on 2nd March, 1618. His youngest brother, Maurice Abbot, was an eminent London merchant, one of the first directors of the East India Company, Lord Mayor, and M.P. for the city. He died in 1640.

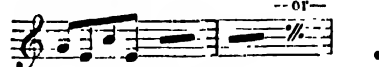
ABBOTSFORD, formerly the seat of Sir Walter Scott, on the south bank of the Tweed, about 3 miles from

Melrose. Sir Walter purchased the property in 1811, and named it Abbotsford. Its original name was *Cartley Hole*. The mansion-house was almost wholly built by Sir Walter, and was completed in 1824. It has been well described as a "romance in stone and lime."

ABBREVIATION, in music. Beside the abbreviation of musical terms, such as *accel.* for *accelerando*, *cresc.* for *crescendo*, *p.* for *piano*, *f.* for *forte*, and the like, which are beyond the purpose of this work, there is a system of abbreviation of musical passages and signs, to save time and space in writing, of which the following are the chief. In music of a single part or instrument, where there is a rest for several consecutive bars, a dash across a bar, with a figure denoting the number of bars' rest above it, is used, thus —

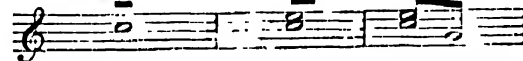


A figure of accompaniment, if often repeated, is written once, and then expressed by a sign.



A tremolando, or a continued repetition of a note or chord, is abbreviated by writing all the notes to be used in one chord of minims or semibreves, and indicating by cross-bars the division into quavers or semiquavers.

Written.



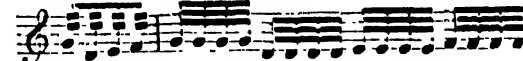
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The following is a very usual abbreviation for the violin:—

Written.

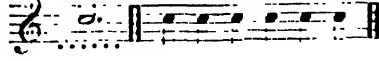
Played.



If division into crotchets is desired, it is manifest that the cross bars cannot be used: dots are used instead of them in this case.

Written.

Played.



SIGNS (as *tr.* the shake, *~*, the turn, &c.), and also the whole system of **FIGURED BASS**, are important musical abbreviations of another kind. They will be found described under their respective headings.

ABBREVIATIONS are contrivances in writing, consisting of arbitrary signs, letters, or groups of letters, taken from a word or words, and employed in their stead for the saving of time and space. They are used by all nations who write, and have been so from the earliest periods. In those times when uncial or lapidary characters were used, it was common to make the initial letter stand for the whole word—as C. for Consul; and syllables, words, and sentences were shortened by omission, as may be seen from inscriptions on monuments, coins, &c. When the small Greek and Roman characters were invented by transcribers to facilitate their work, signs of abbreviation, representing syllables, double consonants, double vowels, and words were largely introduced. Greek MSS. are often very difficult to decipher, on account of the abbreviations with which they abound, and among the Romans L. Annaeus Seneca collected and classified 5000 abbreviations which were used by the

professed scribes of that nation. The same practice was largely followed by the Rabbinical writers, and it was continued and increased during the middle ages—remaining in use until long after the invention of printing. Deciphering these abbreviations requires careful and patient study, and forms a separate science, called Diplomatics, on which several valuable works have been written. An Act of Parliament was passed in the reign of George II., forbidding the use of abbreviations in all legal documents. They are still employed, however, in scientific works, and in publications where it is necessary to save as much space

as possible. They are also used in commercial transactions—every branch of commerce having its own list of abbreviations; and there are certain groups which are so commonly used that the words they represent are very seldom written or printed. To these belong the titles Mr., Mrs., Messrs., Rev., Esq., the points of the compass, and the marks for coins, weights, and measures. Abbreviations are also commonly used in marking quotations from the books of the Bible, from Acts of Parliament, and the more important legal works. The chief abbreviations in general use are given in the following lists:—

ECCLESIASTICAL AND RELIGIOUS.

Abp., Archbishop.
A.C. (Ante Christum), Before Christ.
A.D. (Anno Domini), In the year of the Lord.
A.H. (Anno Hegiræ), In the year of the Hegira.
A.M. (Anno Mundi), In the year of the World.
B.C., Before Christ.
B.D., Bachelor of Divinity.
Bp., Bishop.
Ch. or Chap., Chapter.
D.D., Doctor of Divinity.
Deut., Deuteronomy.
D.G. (Dei Gratia), By the Grace of God.
D.O.M. (Deo Optimo Maximo), To God the Best and Greatest.
D.V. (Deo Volente), God willing.
Ebor. (Eboracensis), Of York.
Ep., Epistle.
Exon., Of Exeter.
F.D. (Fidei Defensor), Defender of the Faith.
I.Ch.Th.U.S. Jesus Christus Theou Huios Soter, Jesus Christ, the Son of God, the Saviour.
I.H.S. (Jesus Hominum Salvator), Jesus the Saviour of Men; or, In hac (cruce) Salus, In this (crucis) salvation.
I.N.R.I. (Jesus Nazarenus Rex Iudeorum), Jesus of Nazareth, King of the Jews.
L.C., Lord Jesus Christ.
Matt., Matthew.
N.T., New Testament.
O.T., Old Testament.
Oxon. (Oxoniensis), Of Oxford.
P.P., Parish Priest.
Rev., Reverend.
R.I.P. (Requiescat in pace), May he rest in peace.
R.T.S., Religious Tract Society.
S. or St., Saint.
S.D.U.K., Society for the Diffusion of Useful Knowledge.
S.P.C.K., Society for Promoting Christian Knowledge.
S.P.G., Society for the Propagation of the Gospel.
S.T.P. Sacrosanctæ Theologiæ Professor, Professor of Sacred Theology.
U.P., United Presbyterian.
V.D.M. (Verbi Dei Minister), Preacher of the Word of God.
V.G., Vicar-general.
Wp., Worship.
Xmas, Christmas.
X., Christ.
Xtian., Christian.

TITLES AND DESIGNATIONS

A.A., Associate of Arts.
A.B., Able-bodied seaman.
A.B. or B.A., Bachelor of Arts.
A.M. or M.A., Master of Arts.
A.P.P., Professor of Astronomy to Greenwich College.
A.R.A., Associate of the Royal Academy.
A.R.S.A., Associate of the Royal Scottish Academy.
B.A. or A.B. (Artium Baccalaureus), Bachelor of Arts.
B.C.L., Bachelor of Civil Law.
B.L. (Baccalaureus Legum), Bachelor of Laws.

B.M. (Baccalaureus Medicinæ), Bachelor of Medicine.
B. Mus., Bachelor of Music.
B.S., Bachelor in Surgery.
B.Sc., Bachelor of Science.
Bt., Bart., Baronet.
C.A., Chartered Accountant.
Capt., Captain.
C.B., Companion of the Bath.
C.C., Caius College.
C.C.C., Corpus Christi College.
C.E., Civil Engineer.
C.M. (Chirurgiæ Magister), Master in Surgery.
C.M.G., Companion of the Order of St. Michael and St. George.
Col., Colonel.
C.P.S., Keeper of the Privy Seal.
C.S., Keeper of the Seals.
C.S.I., Companion of the Star of India.
D.C.L., Doctor of Civil Law.
D.D., Doctor of Divinity.
D.Lit., Doctor of Literature.
D.M., Doctor of Medicine (Oxford).
D. Mus., Doctor of Music.
Dr., Doctor.
D.Sc., Doctor of Science.
F.A.S., Fellow of the Antiquarian Society.
F.B.S., Fellow of the Botanical Society.
F.C.S., Fellow of the Chemical Society.
F.D. (Fidei Defensor), Defender of the Faith.
F.F.P.S., Fellow of the Faculty of Physicians and Surgeons (Glasgow).
F.G.S., Fellow of the Geological Society.
F.K.Q.C.P.I., Fellow of the King and Queen's College of Physicians in Ireland.
F.L.S., Fellow of the Linnæan Society.
F.M., Field Marshal.
F.P.S., Fellow of the Philological Society.
F.R.A.S., Fellow of the Royal Astronomical, or of the Royal Asiatic Society.
F.R.C.P., Fellow of the Royal College of Physicians.
F.R.C.P.E., Fellow of the Royal College of Physicians, Edinburgh.
F.R.C.S., Fellow of the Royal College of Surgeons.
F.R.G.S., Fellow of the Royal Geographical Society.
F.R.S., Fellow of the Royal Society.
F.R.S.L., Fellow of the Royal Society of Edinburgh.
F.R.S.L., Fellow of the Royal Society of Literature.
F.S.A., Fellow of the Society of Antiquaries.
F.S.A. Scot., Do. of Scotland.
F.S.S., Fellow of the Statistical Society.
F.Z.S., Fellow of the Zoological Society.
G.C.B., Knight Grand Cross of the Bath.
G.C.H., Knight Grand Cross of Hanover.
G.C.M.G., Knight Grand Cross of St. Michael and St. George.
G.C.S.I., Knight Grand Commander of the Star of India.
H.R.H., His or Her Royal Highness.
I. (Imperator or Imperatrix), Emperor or Empress.
I.V.D., or J.U.D. (Juris Utriusque Doctor), Doctor both of Civil and Canon Law.
J.P., Justice of the Peace.

K.B., Knight of the Bath.
K.C.B., Knight Commander of the Bath.
K.C.H., Knight Commander of the Order of Hanover.
K.C.M.G., Knight Commander of St. Michael and St. George.
K.G., Knight of the Garter.
K.H., Knight of Hanover.
K.M., Knight of Malta.
Knt., Knight.
K.P., Knight of St. Patrick.
K.T., Knight of the Thistle.
L.A.L., Licentiate of the Apothecaries' Hall.
L.C.J., Lord Chief Justice.
L.D.S., Licentiate of Dental Surgery.
L.L.B. (Legum Baccalaureus), Bachelor of Laws.
L.L.D. (Legum Doctor), Doctor of Laws.
L.L.M. (Legum Magister), Master of Laws.
L.R.C.P., Licentiate of the Royal College of Physicians.
L.R.C.S., Licentiate of the Royal College of Surgeons.
L.S.A., Licentiate of the Apothecaries' Society.
M.A., Master of Arts.
M.B. (Medicine Baccalaureus), Bachelor of Medicine.
M.C., Member of Congress.
M.D. (Medicine Doctor), Doctor of Medicine.
M.P., Member of Parliament.
M.R.C.P., Member of the Royal College of Physicians.
M.R.C.S., Member of the Royal College of Surgeons.
M.R.I.A., Member of the Royal Irish Academy.
M.S., Master in Surgery.
Mus. Bac., or B. Mus., Bachelor of Music.
Mus. Doc., or D. Mus., Doctor of Music.
N.P., Notary Public.
P.C., Privy Counsellor.
P.C.S., Principal Clerk of Session.
Ph.D. (Philosophia Doctor), Doctor of Philosophy.
P.R.A., President of the Royal Academy.
Q.C., Queen's Counsel.
R. (Rex or Regina), King or Queen.
R.A., Royal Academician; Royal Artillery.
R.A.M., Royal Academy of Music.
R.E., Royal Engineer.
Reg. Prof., Regius Professor.
R.M., Royal Marines.
R.N., Royal Navy.
R.S.A., Royal Scottish Academician.
Rt. Hon., Right Honourable.
S.L., Solicitor at Law.
S.M. (Sa Majesté), His or Her Majesty.
S.S.C., Solicitor before the Supremo Courts (of Scotland).
S.T.P. (Sacrae Theologiæ Professor), Professor of Sacred Theology.
V.C., Vice-Chancellor; Victoria Cross.
V.G., Vicar-General.
V.I. (Victoria Imperatrix), Victoria the Empress.
V.R. (Victoria Regina), Victoria the Queen.
V.S., Veterinary Surgeon.
W.B., Writer to the Signet (in Scotland), equivalent to attorney.

MONEYS, WEIGHTS, MEASURES, AND PERIODS.

ac., acre.
 bar., barrel.
 bus., bushel.
 c., cent.
 c. ft. or cub. ft., cubic foot.
 d. (denarius), penny.
 deg., degree.
 dr. or 3, drachm or dram.
 dwt., pennyweight.
 f., franc; fluid, thus, f3j., fluid dram.
 fl., florin.
 ft., foot.
 fur., furlong.
 gal., gallon.
 gr., grain.
 h. or hr., hour.
 hhd., hoghead.
 in., inch.
 kilo., kilometre.
 kilog., kilogramme.
 L., £, or l., pound sterling.
 lb., pound weight.
 m., minute.
 m., mile; also mark (German coin).
 MJ., mium.
 mo., month.
 nl., nail.
 Oj., apothecaries' gallon.
 oz. or 3, ounce.
 pk., peck.
 pol., pole.
 pt., pint.
 q., quadrans, farthing.
 qt., quarter.
 qt., quart.
 ro., rood.
 R., Rupee.
 s. or /, shilling.
 s. or sc., second.
 sc., scr., or 3, scruple.
 sq. in. &c., square inch, &c.
 st., stone.
 yd., yard.

MISCELLANEOUS.

A., Accepted.
 ab init. (ab initio), from the beginning.
 A.C. (Ante Christum), Before Christ.
 acc., a.c., or acct., account.
 ad fin. (ad finem), to the end.
 A.D. (Anno Domini), In the year of our Lord.
 Et or /Etat. In the year of his age.
 A.M. (Anno Mundi), In the year of the World.

A.M. (Ante Meridiem), Before noon.
 Anon., Anonymous.
 A.U.C. (Anno Urbis Condite), From the building of the City, that is, Rome.
 B.C., Before Christ.
 C., Chapter, Centigrade.
 c., cent., or 1/100, a hundred.
 Cf. (Confer), Compare.
 Co., Company, County.
 Cr., Credit, Creditor.
 curt., current, the present month.
 D., in number 600.
 Do., ditto, the said; the same.
 Dr., Debtor.
 e.g. or ex. gr. (exempli gratia), For example.
 E.O.E., Errors and omissions excepted.
 Ex., Example.
 F. or Fahr., Fahrenheit's thermometer.
 Fec. (Fecit), He made (or did) it.
 fo. or fol., folio.
 f.o.b., free on board.
 Gr., Greek.
 gr., gross, grains.
 G.P.O., General Post-Office.
 H.M.S., Her Majesty's Ship.
 Id. or Ibid. (Ibidem), In the same place.
 Id. (Idem), The same.
 i.e. (id est), that is, or that is to say.
 Inf. (Infra), Below.
 Incog. (Incognito, Ital.), Unknown.
 inst., instant, the present month; Institute.
 I.P.D. (In Presentia Dominorum), In presence of the Lords (of Session).
 I.O.U., I owe you.
 Iq. (Idem quod), the same as.
 s.r.a. (sui ra autouta), Kai ta leipomena, same as Et cetera.
 L. or Lib. (Liber), Book.
 Lat., Latitude.
 l.c. (loco citato), in the place cited.
 L.D., Lady-Day.
 Lieut., Lieutenant.
 Lon. or long., Longitude.
 Lond., London.
 L.S. (Locus sigilli), The place of the seal.
 M. (mille), a thousand.
 M., Monsieur; MM., Messieurs.
 Mem. (Memento), Remember, Memorandum.
 MS., Manuscript; MSS., Manuscripts.
 N.B. (Nota bene), Mark well; Take notice.
 N.B., North Britain.
 N.D., No date.
 Nem. con. (Nemine contradicente), No one contradicting.
 No. (Numero), Number.
 N.S., New style (after the year 1752).

Ob. (Obiit), Died.
 Obs., Obsolete.
 O.H.M.S., On Her Majesty's Service.
 O.S., Old style (before the year 1752).
 P., Page; Pp., Pages.
 p (Per), For, e.g. p oz., for one ounce.
 Per ann. (per annum), By the year.
 Per cent. (per centum), For the hundred.
 Pinx. (Pinxit), He painted it.
 P.M. (Post Meridiem), Afternoon.
 P.O., Post-Office.
 P.O.O., Post-Office Order.
 P.P.C. (Pour prendre congé), To take leave; to say good-bye.
 Prox. (Proximo, mense), Next month.
 P.S. (Post scriptum), Postscript.
 Pt., Point.
 P. or Pro tem. (Pro tempore), For the time.
 P.T.O., Please turn over.
 Q., Qu., or Qy., Query, Question.
 Q.d. (Quasi dicat), As if he should say, As much as to say.
 Q.E.D. (Quod erat demonstrandum), Which was to be demonstrated.
 Q.E.F. (Quod erat faciendum), Which was to be done.
 Q. or Quant. suff. (Quantum sufficit), Enough.
 Q. v. (Quod vide), Which see.
 R or R (Recipe), Take.
 ✓ (r for radix), the sign of the square root.
 R.S.V.P. (Repondez, s'il vous plait), Reply, if you please; please answer.
 Rt., right; Rt Hon., Right Honourable.
 S. or St., Saint.
 Sc. (Scilicet), Namely; That is to say.
 Sc. or Sculp. (Sculpsit), He engraved it.
 Seq. q., seqq. or sqq. (sequens, sequentia), the following.
 S.P.Q.R. (Senatus Populusque Romanus), The Senate and People of Rome.
 S.p. (Sine prole), Without offspring.
 St., Street.
 Sup. (supra), above.
 T.C.D., Trinity College, Dublin.
 Ult. (Ultimo, mense), Last month.
 U.S., United States.
 V., Five hundred.
 V. (Versus), Against.
 V. or Vid. (Vide), See.
 Viz. (Videlicet), Namely.
 Wpl., Worshipful.
 Xmas., Christmas.
 Yc. The (obsolete).
 Yt. That (obsolete).
 &c. or etc. (et cetera), And the rest; and so forth.

ABD-EL-KADER, distinguished by his determined resistance to the advance of the French in Algeria, was born there at Ghetna, near Mascara, in 1807. He soon gave evidence of the possession of great mental powers, and at an early age became celebrated for his proficiency in the subjects which comprise Arabian knowledge, and for his powers in horsemanship and manly exercises. His public career commenced in 1829, when, the French having occupied Algiers, the Arab tribes of Oran elected him their emir. At the head of 10,000 men he made war upon the French, and after two sanguinary battles, on December 3, 1833, and January 6, 1834, General Desmichels was compelled to make a treaty greatly in Abd-el-Kader's favour. War soon broke out again, however; and on 28th June, 1835, he inflicted a heavy defeat upon General Tretzel. The French renewed the struggle with largely increased forces, and though Abd-el-Kader made a protracted resistance, he was compelled to surrender to General Lamoricière and the Duc d'Aumale, on December 22, 1847. He was kept a prisoner in France until 1852, when he was liberated by Louis Napoleon. He lived afterwards first at Brussa, then Constantinople, and finally at Damascus, where he saved many lives during

the Syrian massacre of 1860. He visited France and England in 1865, and was present at the French Exhibition of 1867. He died at Damascus in May, 1883.

ABDICATION (from the Latin *abdicatio*) is the voluntary giving up of an office by the party who holds it. The term is now generally applied to the giving up of the kingly office. The King of England cannot, except with the consent of the two Houses of Parliament, abdicate in a constitutional form; for a proper abdication would be a divesting himself of his regal powers by his own will, which is inconsistent with the nature of his kingly office. It is, however, established by a precedent, that he abdicates, or an abdication may be presumed, if he does acts which are inconsistent with that system of government of which he forms a part. In Blackstone's "Commentaries," vol. i. pp. 210-212, and iv. p. 78, mention is made of the resolution of both Houses, in 1688, that "King James II. having endeavoured to subvert the constitution of the kingdom by breaking the original contract between king and people; and by the advice of Jesuits and other wicked persons having violated the fundamental laws, and having withdrawn himself out of the kingdom, has abdicated the government, and that the throne is thereby vacant."

Thus it appears that the Houses of Lords and Commons assumed the doctrine of an original contract between the king and the people as the foundation of their declaration that James II. had abdicated the throne; and Blackstone, in arguing upon this declaration, assumes, what is contrary to the evidence of history, that the powers of the King of England were originally delegated to him by the nation.

In the conference between the two Houses of Parliament, previous to the passing of the statute which settled the crown upon William III., it was disputed whether the word "abdicated," or "deserted," should be the term used to denote in the "Journals," the conduct of James II. in quitting the country. It was then resolved that the word "abdicate" should be used, as including maladministration. But by making this resolution the House gave a new meaning to the word.

Among the Romans the term "abdicate" signified generally a rejection or giving up a thing; and a magistrate was said to abdicate who for any reason gave up his office before the term was expired.

The following is a list of the more important abdications of the present century:—

Charles Emanuel IV. of Sardinia.	June 4, 1802.
Charles IV. of Spain.	March 19, 1808.
Joseph Bonaparte of Naples.	June 6, 1808.
Gustavus IV. of Sweden.	March 29, 1809.
Louis Bonaparte of Holland.	July 2, 1810.
Napoleon of France.	April 11, 1814. (June 22, 1815.)
Victor Emanuel of Sardinia.	March 13, 1821.
Charles X. of France.	August 2, 1830.
William I. of Holland.	October 7, 1840.
Louis Philippe of France.	February 24, 1848.
Ferdinand of Austria.	December 2, 1848.
Charles Albert of Sardinia.	March 23, 1849.
Isabella II. of Spain.	June 25, 1870.
Amadeus I. of Spain.	February 11, 1873.

ABDO'MEN. The human body is divided by anatomists into three portions—the head, the trunk, and the limbs. The trunk forms two cavities—the upper, the thorax or chest; and the lower, the abdomen or belly. There is a complete partition between the cavity of the chest and that of the abdomen, effected by means of the diaphragm, which is composed partly of membrane, but chiefly of muscle. It is placed transversely across the trunk at about its middle portion, dividing it into two pretty nearly equal halves. See RESPIRATION.

The cavity of the abdomen is bounded above by the diaphragm; below by the bones of the pelvis or basin, which may be considered as belonging to the bones of the lower extremities; before and at the sides by the abdominal muscles; behind partly by the muscles of the loins and partly by the bone of the spine. It is lined throughout by a thin but dense, firm, and strong membrane, termed the peritoneum. The diaphragm is pierced by the alimentary canal and that part of the nervous system known as the sympathetic ganglia. These pass down from the thorax into the abdomen, which also contains the two kidneys, the liver, the spleen, and the pancreas or sweetbread.

We have spoken of the abdomen as a cavity, but without explanation this mode of expression may occasion misconception. During the state of life there is no cavity. The abdomen is always completely full. The diaphragm alternately enlarges and diminishes the space proper to the abdomen; but the abdominal and lumbar muscles which form so large a part of the boundaries of the abdomen in front, at the sides, and behind, in like manner alternately contract and relax. The consequence is that a firm and uniform pressure is at all times maintained upon the whole

contents of the abdomen, so that there is always the most exact adaptation of the containing to the contained parts, and of the viscera one to the other, not the slightest space or cavity ever intervening either between the walls of the abdomen and its viscera, or between one viscus and another.

ABDOMEN, in Insects, Crustacea, etc., is the term used for the whole portion of the body of an insect behind the thorax, including the back as well as the belly. It consists of rings or segments, the typical number of which is eleven. It contains part of the intestines, and on its last segments are found stings, genital organs, etc. On the side area (*pleurite*) of each ring between the upper portion (*tergite*) and the lower (*sternite*) are situated the breathing pores, which may easily be seen in the large water-beetle *Dytiscus*. The *pleurites* and *sternites* gradually disappear towards the tip, till the last segment is formed only of the *tergite*. In caterpillars, grubs, and wingless insects such as the flea, where the joining of the thorax with the abdomen is not apparent, the abdomen may always be known by the legs never being jointed with it; and in caterpillars it usually consists of all the body behind the six fore-legs, which are always on the thorax. See STOMACH.

ABDOMINALIA, in Fishes, are those groups of the *Physostomi* which have the ventral fins situated on the abdomen.

ABDUCTION, a term used in the criminal law of England, signifying the unlawful taking away of the person of a female. In the case of a male it is usual to employ the term kidnapping. This offence may be committed either by force or fraud; and in the case of girls under sixteen it makes no difference whether the girl consents or not. With regard to the

Abduction of Children, it is provided by the 21st and 25th Vic., c. 100, s. 56, that if any person shall unlawfully lead or take away, or decoy and entice away, or detain any child under the age of fourteen, with intent to deprive any parent, guardian, or other person having the care of such child, of her possession, or with intent to steal any article upon or about her; or shall, with any such intent as aforesaid, receive or harbour such child, knowing the same to have been so stolen or enticed, every such offender shall be guilty of felony, and shall be liable to penal servitude for seven years, or imprisonment with or without hard labour for any term not more than two years; and also, if a male, to be whipped—such male being under sixteen. And whosoever shall take, or cause to be taken, any unmarried girl under sixteen out of the possession and against the will of her father or mother, or other person having charge of her, shall be guilty of a misdemeanour, and shall be liable to a term of imprisonment not exceeding two years.

Abduction of Wife.—This was formerly an offence rendering the person guilty liable to imprisonment for two years, and the payment of a fine at the pleasure of the crown. At the present time, under the statutes relating to divorce and matrimonial causes, the marriage may be annulled with, in the case of the wife's adultery, damages from the adulterer; or the husband and wife may be judicially separated.

Abduction of a Ward or Pupil.—By the law of England a guardian is entitled to bring an action against any one taking from him the custody of his ward or pupil; but the proper remedy now is by an application to the Court of Chancery, which is the supreme guardian of, and has independent jurisdiction over, all the infants in the kingdom. In Scotland a similar jurisdiction is exercised by the Court of Session.

Abduction of an Heiress.—By the 24th and 25th Vic., c. 100, it is enacted that where a woman shall have interest, present or future, in any real or personal estate, or shall be heiress presumptive or next of kin to any one

having such interest, if any person shall, from motives of lucre or otherwise, take away or detain such woman against her will, with intent to marry or carnally know her, or cause her to be married or carnally known by any other person, shall be guilty of felony, and be subject to penal servitude for fourteen years and not less than three years, or to imprisonment with or without hard labour for any term not exceeding two years. In such case the person convicted forfeits all right and interest in the property which otherwise would have come to him by marriage.

Abduction of Women generally.—By the same statute the protection given to an heiress is extended to women generally, and the crime of abduction makes the offender liable to a similar punishment.

A'BECKET. See BECKET.

ABEL, KARL FRIEDRICH, a famous performer on the now obsolete *Viol da Gamba*, born at Cöthen in 1725, educated by the great Sebastian Bach at Leipzig. In 1759 he came to England, and was appointed chamber musician to Queen Charlotte, and subsequently lived and worked here with John Christian Bach (the "English Bach"), son of Sebastian. He died in 1787, a victim to intemperance. He was much esteemed as a composer and teacher in his day, and the celebrated J. B. Cramer was amongst his pupils.

ABELARD, or **ABAILARD, PIERRE**, was born in 1079, at Palais, in Brittany. His father was a man of some rank and property, and spared no expense in the education of Abelard. He left Palais before he was twenty years of age, and went to Paris, where he became a pupil of Guillaume de Champeaux, a teacher of logic and philosophy of the highest reputation in those times. At first the favourite disciple, by degrees Abelard became the rival, and finally the antagonist of Champeaux. To escape the persecution of his former master, Abelard, at the age of twenty-two, removed to Melun, and established himself there as a teacher with great success. Thence he removed to Corbeil, where his labours seem to have injured his health, and he sought repose and restoration by retirement to his native place, Palais, where he remained a few years, and then returned to Paris. The controversy between the two antagonists was then renewed, and the contests continued till Champeaux's scholars deserted him, and he retired to a monastery.

The dialectic conflicts having now ceased, Abelard commenced the study of divinity, under Anselm, at Laon. Here also the pupil became the rival of his master, and Anselm at length had him expelled from Laon, when he returned to Paris, and established a school of divinity, which was still more numerous attended than his former schools had been. Guizot says, "In this celebrated school were trained one pope (Celestine II.), nineteen cardinals, more than fifty bishops and archbishops, French, English, and German, and a much larger number of those men with whom popes, bishops, and cardinals had often to contend, such as Arnold of Brescia, and many others. The number of pupils who used at that time to assemble round Abelard has been estimated at upwards of 5000."

Abelard was about thirty-five or thirty-six years of age when he formed an acquaintance with Heloise, the niece of Fulbert, a canon in the cathedral of Paris. She was probably under twenty years of age. Abelard fell in love with Heloise, and got himself introduced into the house of Fulbert as the tutor of his niece. The result was a criminal intercourse between the two lovers, which was at length discovered by Fulbert, and Heloise was removed by Abelard to the residence of his sister in Brittany, where she gave birth to a boy.

Fulbert insisted that the wounded honour of his niece should be repaired by a marriage, to which Abelard assented willingly, but Heloise with more reluctance, pro-

bably from a fear that his prospects would be ruined—the highest dignities of the church in those days being exclusively bestowed on unmarried ecclesiastics. The marriage took place at Paris, and it was agreed to be kept secret; but Fulbert took pains to make it public, while Heloise, who resided with him, denied it. The consequence was that her uncle treated her with great harshness, and Abelard took her away and placed her in the convent of Argenteuil, near Paris. Fulbert, who seems to have thought that he intended to make her a nun in order to get rid of the incumbrance of a wife, vowed a cruel revenge, which he soon found means to execute. The valet having been bribed, admitted Fulbert and his party into Abelard's bed-room by night, when they performed a cruel mutilation of his person. Abelard recovered from the wound, but as the canon law rendered him incapable of holding any ecclesiastical preferment he entered the abbey of St. Denis as a monk, and Heloise became a nun in the convent of Argenteuil.

The abbot and monks of St. Denis were dissolute, and Abelard's efforts to bring about reformation awakened their resentment, so that he was compelled by their threats and persecutions to fly, and place himself under the protection of the Count of Champagne. In a solitary spot of the territory of Troyes he erected a small oratory of wickerwork and thatch, and commenced giving lectures, to which scholars crowded from far and near; the wickerwork was then changed into a building of stone and timber, and Abelard named it Paraclete, or "the Comforter." But persecution still attending him, he left the Paraclete to become superior of the monks in the abbey of St. Gildas of Ruys, near Vannes, in Brittany.

Heloise, too, was not without her share of troubles. The convent of Argenteuil, of which she had been made prioress, was claimed by an abbot as belonging to his abbey, and Heloise and her nuns were ordered to leave it. Abelard gave them the Paraclete, and there they were established; Abelard himself, after eleven years of separation from Heloise, officiating in the ceremony of consecration.

Bernard, abbot of Clairvaux, whose monastery was not far from the Paraclete, having objected to some of the forms of prayer used by Heloise and her nuns, Abelard defended them; and this led to a controversy with the abbot, who eventually accused Abelard of heresy. Abelard appealed to a council which was held in the year 1140, in the cathedral of Sens, in Champagne, where he defended himself. But the influence of Bernard was more powerful than the logic of Abelard. He was condemned by the assembly; but he appealed to the pope, and set out on his journey to Rome, which, however, he never reached, having been induced by Peter the Venerable to remain in his monastery at Cluni, near Mâcon. The pope confirmed the sentence of the council of Sens, and Abelard was ordered to be confined, all his works to be burned, and he himself was prohibited from writing anything more. Peter the Venerable addressed a remonstrance to the pope, Innocent II., and the sentence was suspended. During this suspension Abelard was removed to the priory of St. Marcel, near Châlons, for change of air, and there he died 21st April, 1142, in the 63rd year of his age. He was at first interred by the monks of Cluni in their monastery, but his remains were afterwards removed to the Paraclete.

Heloise lived twenty years afterwards, as prioress of the Paraclete, and when she died was buried, at her own request, in Abelard's tomb. The remains of Abelard and Heloise continued undisturbed for upwards of 300 years, but in 1497 they were removed to the church of the abbey, and were afterwards shifted to other places. In 1800 they were removed to the garden of the Musée Français at Paris, and in 1817 were placed in the cemetery of Père la Chaise, where they still remain beneath their Gothic tomb.

Abelard was a proficient in the scholastic learning of the times, a dexterous dialectician, and a subtle thinker. His theological works gave an impulse to the age, and though his writings are of little value now, they belong to the history of philosophy and the progress of the human mind. The personal character of Abelard is best shown by his letters and those of Heloise. When he had once transgressed the bounds of his duty by his illicit intercourse with Heloise, he lost all self-control, and appears as a sensualist. When his misfortunes drove him from the world, he became cold and unfeeling towards the noble-minded woman, whose passion and ardent attachment show that she was capable of the most unbounded devotion to him whom she loved. The narrative of Abelard's life is contained in his autobiography, entitled "*Historia Calamitatum suarum*." Pope has rendered into English verse some of the supposed letters between Heloise and Abelard. The most complete edition of their works is



White Poplar.

"*Petri Abelardi et Heloise Conjugis ejus Opera, nunc primum edita ex MSS. Cod. Francisci Ambrosii*," Paris, 1616. Also M. Victor Cousin also published "*Ouvrages Inédits d'Abelard*," Paris, 1836. There are several other editions, some of which have portions, such as the "Letters," translated.

ABELÉ TREE (*Populus alba*), or White Poplar, is distinguished from other **POPULARS** by the leaves being cottony or stovey white on the under side, and the stem, flowers, buds, cross-like. The abelé poplar is a highly ornamental tree and a fast grower. It is therefore often selected for belting or plantation purposes. The under surfaces of its leaves are beautifully white, and are exposed to view by every breath of wind. Trees with leaves of this character are called wind trees. The abelé is quite as showy in the distance as a healthy specimen of evergreen oak. It is a native of Central and Southern Europe, North Africa, Persia, Siberia, and the East Indies.

ABELMOSCHUS. See **HIBISCUS**.

ABENCERRAGES, a family said to have held a prominent position in the Moorish kingdom of Granada in the fifteenth century. The story of their feud with the family of the Zegris, and their massacre in the palace of the Alhambra about the year 1460, form the subject of a Spanish romance, entitled "*Historia de las Guerras Civiles de Granada*," by Gines Perez de Hita (Madrid, 1694). This is the original from which Chateaubriand composed "*Les Aventures du Dernier Abencerrage*," and Florian his "*Gonsalvo de Cordova*." There is a hall in the palace of the Alhambra which is still shown as the scene of the massacre, but the story has very little historical foundation.

ABEN ESRA, or with his complete name, *Abraham ben Meir ben Esra*, a celebrated Jewish scholar, was born at Toledo, probably in A.D. 1119, and died about 1194, at the age of seventy-five years. A considerable portion of his life was spent in travelling. He visited Mantua in 1145, and the island of Rhodes in 1156; in 1159 he was in England, and in 1167 at Rome. His celebrity among his contemporaries, as a scholar and as an accomplished writer of the Hebrew language, was very great. Among ourselves Aben Esra has become known chiefly through his great commentary on the Old Testament, which, it seems, he wrote at different periods between the years 1140 and 1167. It was printed in the great Rabbinical editions of the Bible which appeared at Venice, Bâle, and Amsterdam; and there have been, besides, many separate editions of single parts of it. Aben Esra also wrote on mathematics, philosophy, medicine, philology, and astrology. His treatise, in verse, on the game of chess, translated by Thomas Hyde (Oxford, 1694), affords us a specimen of his skill in poetic composition.

ABER, a Celtic term which forms the prefix of several names of places in Great Britain. It means generally the mouth or embouchure of a river, whether it falls into the sea or into another river; and sometimes it means a port or harbour. Most of the places so named are in Wales, as Abergavenny, at the confluence of the Usk and Gavenny, and Aberystwith, at the outlet of the Ystwith; and in Scotland, as Aberbrothock (Arbroath), at the mouth of the Brothock, in Forfarshire; Aberdour, at the mouth of the Donr, in Aberdeenshire.

ABERAVON, or **PORT TALBOT**, a municipal borough, and also a contributory borough to the Swansea parliamentary district, Glamorganshire, is about 8 miles E. from Swansea, and 203 from London by the Great Western Railway. It is beautifully situated on the south-east bank of the Avon, about 2 miles from its mouth, near the valley of Cwm Avon, which is shut in by lofty hills, and in which are some extensive collieries and mining and smelting works. The part of the town called Port Talbot is modern, having grown up since the construction of the harbour. Ore is imported for smelting, and there is a good trade in the export of coal—from 20,000 to 25,000 tons being shipped annually. The population of the municipal borough in 1881 was 4859—an increase of 1285 since 1871.

ABERBROTHOCK. See **ARBROATH**.

ABERCROMBIE, JOHN, M.D., was born on the 11th of November, 1781. He was the son of the Rev. Mr. Abercrombie, for many years one of the town ministers of Aberdeen. He studied medicine in the Scottish metropolis, and took his degree there on the 4th of June, 1803. He became a Fellow of the Royal College of Surgeons in 1805, a licentiate of the Royal College of Physicians in 1823, and in 1824 was admitted a Fellow of the body. In 1831 the University of Oxford marked their estimation of his character and talents by conferring on him the honorary degree of Doctor of Medicine. In the year 1835 Dr. Abercrombie was elected Lord Rector of the Marischal College of Aberdeen. He died suddenly, on November 14, 1844, at his house in York Place, Edinburgh.

The writings of Dr. Abercrombie contributed no less to the establishment and maintenance of his fame, than his singularly useful career as a practical member of his profession. In the early part of his course he confined his literary labours to the *Edinburgh Medical and Surgical Journal*, and other periodicals in his own department of science. His first distinct work was one entitled "Pathological and Practical Researches on Diseases of the Brain and the Spinal Cord," Edinburgh, 1828, 8vo. In the same year he also published "Pathological and Practical Researches on the Diseases of the Intestinal Canal, Liver, and other Viscera of the Abdomen," Edinburgh, 8vo. In 1830 appeared his "Inquiries concerning the Intellectual Powers and the Investigation of Truth," Edinburgh, 8vo; and in 1833 "The Philosophy of the Moral Feelings," London, 8vo. The latter is, in some measure, a sequel to the first, and the whole composes a view of human nature intellectually and morally, in which the facts of science and the revelations of religion are combined together in peculiar harmony. The best of these two works, in every respect, is that on the Intellectual Powers. For range of acquirements, solid as well as extensive, Dr. Abercrombie stood unequalled among the Scottish physicians of his day.

ABERCROMBY, SIR RALPH, was the son of George Abercromby, Esq., of Tullibody, in Clackmannanshire. Ralph Abercromby was born in October, 1731, at Menstry, in Clackmannanshire. After receiving a liberal education, he entered the army in March, 1756, as a cornet in the 3rd regiment of Dragoon Guards. By the year 1787 he had reached the rank of major-general. When the war with France broke out, in 1793, Abercromby was sent to Holland, with the local rank of lieutenant-general, in the expedition commanded by the Duke of York. His bravery during the prosperous commencement of this campaign was not more conspicuous than the skill, energy, and humanity with which he conducted the disastrous retreat. He returned to England in April, 1795, and in August of the same year he was sent to the West Indies, as commander-in-chief of the forces there. In 1796 he took in succession Grenada, Demerara, Essequibo, St. Lucia; and St. Vincent and Trinidad in February, 1797. On his return to England he found that he had been made a Knight of the Bath, and raised to the rank of lieutenant-general; and soon afterwards he received the command of the 2nd or North British Dragoons (the Scotch Greys), and the appointment of lieutenant-governor of the Isle of Wight. For a short time during the Irish rebellion he was in command of the forces in Ireland, but having remonstrated with the government for their treatment of that country, he was removed to the chief military command of Scotland. In the second expedition to Holland, in 1799, he again accompanied the Duke of York, and, notwithstanding the disasters which attended that campaign, he returned with an increased reputation for bravery and military talent. In 1801 Sir Ralph Abercromby was appointed to the command of the expedition to Egypt, and on the 8th March he effected the landing of his troops in the Bay of Aboukir. On the 13th the French were driven within the lines of Alexandria, and on the 21st was fought the obstinate battle known as the Battle of Alexandria. The French were completely defeated, but Sir Ralph was mortally wounded during the engagement, and died 28th March, 1801, in his sixty-eighth year. His body was interred near the town of La Valetta, in Malta. A monument was, by order of the House of Commons, erected to his memory in St. Paul's Cathedral. On his death his widow was created Baroness Abercromby, of Aboukir and Tullibody.

ABERDARE, a contributory borough to the Merthyr Tydvil parliamentary district, Glamorganshire, is on the

south-west bank of the Cynon, 4 miles S.W. from Merthyr Tydvil, and 193 from London by the Great Western Railway. There are very extensive coal-mines and iron-works in the neighbourhood, and from a mere village Aberdare has now grown into a large town. The population of the urban sanitary district in 1881 was 33,804. Much of the coal is used in the iron-works, but a large quantity is also sent to Cardiff for shipment. The quantity raised in the parish annually is nearly 2,000,000 tons. The town is situated in a fine valley, and is on the whole well built, most of the houses being, of course, modern. There are several churches, places of worship for all denominations of dissenters, banks, and other buildings suitable for a large modern town. There is an ample supply of water, and a people's park.

ABERDEEN, GEORGE HAMILTON GORDON, EARL OF, was born January 28, 1784. He was educated at Harrow and Cambridge, where he took the degree of M.A. He succeeded to the earldom in 1801, and entered public life in 1806, when he was elected one of the sixteen representative peers of Scotland. In 1813 he was sent as ambassador to Vienna, and charged with the conduct of the negotiations which terminated in an alliance with Austria against Napoleon. On his return, at the conclusion of the war, he was created Viscount Gordon. In 1828 he took office in the ministry of the Duke of Wellington as secretary of state for foreign affairs. He was colonial secretary during the administration of Sir Robert Peel (1831-35), and foreign secretary under him again in (1841-46). In 1843 he carried a bill "to remove doubts respecting the admission of ministers to benefices in Scotland," which was generally known as the Aberdeen Act. It gave, however, but little satisfaction to those whom it was intended to benefit, and failed to prevent the Disruption in the Established Church in Scotland, which took place the same year. In 1846 he resigned with Sir Robert Peel, but in 1852 he was placed at the head of the coalition ministry, formed of Whigs and Peelites. The policy of the cabinet, in connection with the war with Russia, caused general dissatisfaction, and the terrible mismanagement of the army authorities led to the passing of a vote of inquiry by the House of Commons; and on the 1st February, 1855, Lord Aberdeen, with the cabinet, resigned office. He was created Knight of the Garter in recognition of his services, but subsequently took little part in political affairs. He died at London 11th December, 1860. In politics he began public life as a Tory, but his opinions gradually merged into a Liberal Conservatism, and he both spoke and voted in favour of Catholic emancipation, the repeal of the Test and Corporation Acts, and of the corn laws. In his conduct of foreign affairs his leading principle was that of non-intervention, to which he steadfastly adhered.

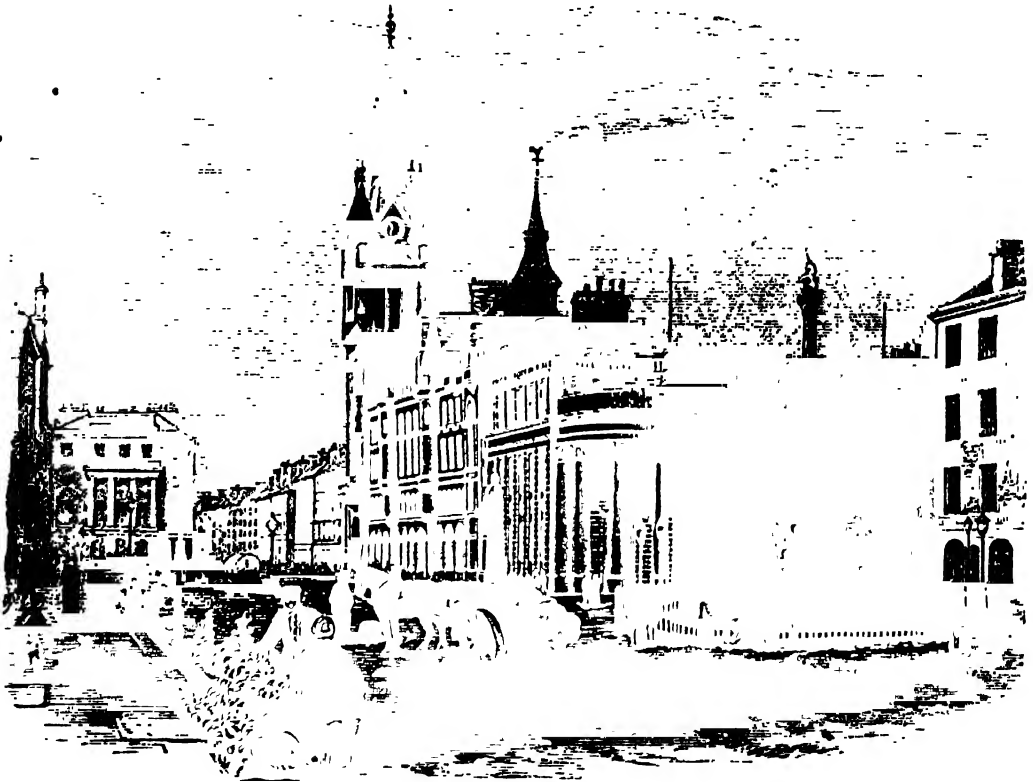
ABERDEEN, a city, royal and parliamentary borough, and seaport in Scotland, the capital of Aberdeenshire, is situated in the S.E. of the county, on the north side of the river Dee, where it is discharged into the German Ocean. It is 111 miles N.N.E. of Edinburgh, and 512 miles from London by railway. The population of the parliamentary borough increased from 88,181 in 1871 to 105,003 in 1881. The town is thus the fourth in size in Scotland. It formerly returned one member to the House of Commons but an additional one was granted to it in 1885.

Aberdeen has been much improved and enlarged during the present century. It now extends 8 miles in circuit, and has an exceedingly flourishing and handsome appearance, its fine granite architecture being the admiration of all visitors. The chief thoroughfare is Union Street, which, with its eastward and westward terminations—Castle Street and Union Place—is about a mile in length and 70 feet wide. The principal buildings are, the county

and municipal offices—an imposing Franco-Scottish-Gothic structure, with tower 200 feet high—erected 1867-73, at a cost of £80,000; the post and telegraph offices, opened in 1876; several banks, some of them very handsome buildings; music hall, capable of containing 2000 persons; corn exchange, grammar-school, and Gordon's Hospital for the education of the sons of poor burghers. There are also sixty places of worship, including the church of St. Nicholas, restored in 1878, after having been almost destroyed by fire. The cathedral in Old Aberdeen, dedicated to St. Machar, a companion of St. Columba, consists of a stately nave and side aisles. It is still used as the parish church. There are numerous charitable endowments. The city contains handsome statues of the Queen and Prince Consort, and of the Duke of Gordon. Near the latter is an interesting cross, originally erected in 1686, but removed to its present site and rebuilt in

1842. There is a colossal bronze statue of Wallace in the Duthie park. There are barracks for infantry and militia. The drainage of the town has of late years been much improved, and there is now an excellent and abundant supply of water obtained from Cairnton, on the Dee, about 21 miles distant. The course of the river having been altered to the southward has allowed of a considerable extension of the town in that direction. A handsome granite bridge, of five arches, which crosses the river in line with Market Street, was opened in 1880. The Duthie Park (named after the donor, Miss Duthie) was opened by the Princess Beatrice in 1883. It is 47 acres in extent, and cost £50,000. It is within 2 miles of the centre of the city.

Aberdeen has long been celebrated for its educational institutions, and it still maintains its old renown. So early as 1418 it was noted for its grammar-school. Marischal



Aberdeen.

College was founded by George Keith, Earl Marischal, in 1593, and rebuilt in 1837 of granite in the Gothic style. On the recommendation of the university commissioners, Marischal was joined by King's College (founded in 1494), Old Aberdeen, in 1860; and they now form one university, under the governing body. There are eight scholarships, of the annual value of from £70 to £100 each; and about 250 bursaries, of from £5 to £50 each. The library comprises over 80,000 volumes. The excellent education given in the university has been the means of disseminating much useful knowledge over the north of Scotland; particularly in improving the character of the parochial schoolmasters, most of whom have been educated there. The number of bursaries, which are mostly disposed of by com-

petitive trial, is an inducement to attend. The cost of education, too, apart from the bursaries, is exceedingly moderate. The total fees for the four years over which the studies extend only amount to from £25 to £30, and respectable board may be had at from £25 to £35 for the session, which commences in October and ends in April. In 1882 there were twenty-one professors and about 700 students. The university is noted for the thoroughness of its Latin scholarship, and has produced many illustrious names in literature and philosophy. Since 1868 the university has, in conjunction with that of Glasgow, sent a member to Parliament.

Aberdeen is a place of large trade, having some very extensive food-preserving establishments, manufactures of

combs, cotton, linen, woollen, and carpets; paper-mills, breweries, distilleries, extensive iron-works, shipbuilding yards, including some for large steam-vessels, and manufactures of most of the articles connected with ships and shipbuilding. A large number of persons are also employed in cutting and polishing the well-known gray granite found in the neighbourhood. The salmon fishery is of great importance to the town. More than 200 men are engaged in it, and 20,000 fish are annually taken, most of which are packed in ice and sent to the London market. The harbour of Aberdeen has been very much improved in recent years, and is now considered one of the best tidal harbours in Scotland. The anchorage is spacious, and is rendered safe by a pier of granite on the north side of the Dee, which was lengthened from 2000 feet to 2550 feet in 1874, and a breakwater on the south-east. The latter is 1050 feet in length. There are various commodious docks. The number of vessels registered as belonging to the port in 1885 was 200 (110,000 tons). The entries and clearances each average 2300 (550,000 tons per annum). The customs revenue is about £90,000 per annum. The chief trade is with London, but steamers also ply to Leith, Newcastle, Wick, Thurso, and Lerwick, and there is some foreign trade with North America, the East and West Indies, the Mediterranean, and the Baltic. The exports are granite, oats, cattle, butter, salmon, Fin-don haddocks, cotton and woollen goods.

In commemoration of a great victory over the Danes, in 1010, Malcolm III. founded a bishopric at Mortlach, in Banffshire. The see was removed to Aberdeen early in the twelfth century, and was discontinued in 1689. William the Lion, the first patron of Aberdeen, granted the city a charter in 1179, and established a mint there. In the latter part of the thirteenth century and the beginning of the fourteenth, the town was the scene of many of the incidents of the Scottish War of Independence. In 1336 it was burnt to the ground by the English. The city erected upon its site was called New Aberdeen, in order to distinguish it from its predecessor. During the civil wars in the reigns of Charles I. and II. Aberdeen suffered severely, first for its loyalty and afterwards for its reforming zeal.

OLD ABERDEEN, formerly and properly called *Aberdon*, is situated on the south side of the Don, near its mouth, a short distance from Aberdeen. It is sometimes called Old Machar, from the cathedral of St. Machar, part of which is now used as the parish church of the parish of Old Machar. The only other building of importance in Old Aberdeen is the fine old structure of King's College, near the middle of the town. The chapel is still used for worship during the university session. Population, 2186.

ABERDEENSHIRE is bounded on the N.E. and E. by the North Sea; on the other sides by Kincardineshire, Forfarshire, Perthshire, Inverness-shire, and Banffshire. Its greatest length is about 86 miles; and its greatest breadth, 47 miles. The area is 1970 square miles, or 1,260,025 acres. It is in size the fifth of the Scottish counties. The population in 1871 was 244,603; in 1881 it had increased to 267,990, and it thus ranks third amongst the Scotch counties as regards the number of its inhabitants. In 1801 the population was only 121,000.

Coast-line.—The coast of Aberdeenshire has a tolerably regular outline, for the most part convex to the sea. From the mouth of the Dee it proceeds in a pretty direct line for 12 miles north by east; but afterwards it bends more westward, and has several points and headlands. Buchan Ness and Keith Inch Point are the easternmost points of the mainland of Scotland. The coast-line is much varied further north, being skirted in some places by rocks rising 170 or 200 feet above the level of the sea. These rocks are penetrated by some remarkable fissures and caverns, which formerly afforded great facilities for

the concealment of smuggled goods. The rocks are chiefly of black basalt, gneiss, mica slate, or red granite. Beyond Ratray Head are some remarkable caves in the rocks, one of which served as a hiding-place to Lord Pitsligo after the battle of Culloden, in 1746.

Surface and Geology.—The county is generally hilly; in the south-western part it is mountainous. The principal range of the Grampians forms, for a considerable distance, the southern boundary; and branches from this range traverse the county in other directions. Among the chief summits are Cairn Tagart or Taggart (about 3000 feet high), Lochnagar (3786 feet), Mount Kean (3126 feet), Cairn Toul (4210 feet), Ben Macdhui, or Bennamuckduidh (4296 feet, being thus the highest mountain in Great Britain after Ben Nevis, which is 4406 feet). The mountain district of Braemar, in which or the neighbourhood most of these peaks are included, is chiefly granitic. The mountains frequently present tabular summits with steep precipitous sides; they vary in character, presenting sometimes mural precipices, sometimes slopes more or less steep.

The neighbourhood of Aberdeen is occupied by granite, which is quarried in large quantities, and shipped at Aberdeen to all parts of the world. Red granite is quarried very extensively at Stirlinghill, near Peterhead. It is frequently disintegrated, at least in so friable a state as to be easily dug into by the pickaxe and spade; yet large blocks of fine building-stone are frequently quarried in the midst of a mass of disintegrated rock.

Syenite is found in various parts; and gneiss is met with in the districts adjacent to the granite, but not in great quantity. The predominant rock in the county is mica slate. In the parts adjacent to the granite it is quartzose and very compact, showing a tendency to pass into gneiss, or alternating with that rock. Serpentine and primitive limestone are found in a few places; as are also clay slates, porphyry (near Boddam), old red sandstone, and magnesian limestone. Trap rocks and veins or dykes of trap also occur.

Rivers.—The principal rivers of the county are the Dee, the Don, the Ythan, the Ugie, and the Deveron or Deveran, with their respective tributaries. The Dee rises in the south-western part of the county, high up the side of the mountain Breriarich, at an altitude of above 4000 feet; and in the first few miles of its course there are several falls, or, as they are termed, "lincs," of which the principal, not from its height but its turbulence, is the Linn of Dee; the river here forces its way by four successive falls or rapids through a passage of rock, so narrow in some places that some persons have been hardly enough to step across it. The whole course of the river is about 90 miles. It receives, among other minor streams, the Muick, 12 miles long, on the right bank. In the upper part of the Muick are two small but picturesque lakes. Dhu Loch ("Black Lake") is supposed to obtain its name from its being overshadowed by the lofty cliffs of Craig Dhu Loch, which rise from its southern border over 1000 feet. A mountain rill falls into it on the north side from a height of more than 200 feet. The other lake is called Loch Muick. The Dee descends 1000 feet in 80 miles, and is a rapid stream. It is chiefly valuable for its salmon fishery. The mouth forms the harbour of Aberdeen. The Don, 78 miles in length, rises just on the western border of the county; its source is elevated about 1610 feet above the level of the sea, and its course is very winding. The river takes its rise in a peat moss; in the upper part of its course it is very rapid, but lower down it is slower. The principal affluent is the Ury, or Urie. The Ythan rises near the north-western border of the county, and flows into the North Sea after a course of about 36 miles. It is a slow and gentle stream; but from the very extensive system of drainage

adopted in the lands through which it flows, is subject to rise somewhat suddenly. It has a considerable volume of water; but the shallowness of the mouth greatly impedes navigation. The river abounds with trout, finnock, eels, flounders, and salmon, and is regularly fished for pearls, in common with several other rivers in Scotland. The Ugie is formed by two streams—the North Ugie and the South Ugie—which flow separately about 15 or 18 miles each, and then about 6 more after their union. From the trifling declivity and winding course of its channel the Ugie is a very slow stream. It contains an abundance of trout. It is navigable only near the mouth. The Deveron or Deveran has a course of about 50 miles, and in part separates Aberdeenshire from Banffshire. It is a rapid stream, flowing for a considerable part of its course through a deep, narrow vale, and is subject to serious floods. It contains excellent trout. A considerable salmon fishery is carried on.

Agriculture, Manufactures, &c.—Agriculture has been making steady progress for many years; and much land, naturally poor, has been rendered fertile by judicious cultivation. Large tracts of waste land have also been reclaimed. The usual rotation of crops occupies six years—three years as pasture, one under root crops, and two under grain. The chief crops are oats and turnips. The farm-houses are commodious, and the offices also are generally of a superior description, built of stone, with slated roofs.

In the parishes between the Dee and the Don the farms are from 50 to 150 acres, the generality of them about 100; besides which there are a number of "crofts," or small farms, of from 3 to 6, and occasionally of 10 or even 20 acres. About three-fourths of the district is under the plough. Much of the arable land is inclosed with dry stone walls and thorn hedges. Of the land in the parishes near the coast four-fifths are under cultivation. The soil varies much, being in some parts black peaty earth, in others deep retentive clay, and in others fertile loam. The husbandry is generally very good. In 1885 there were 608,000 acres, or nearly one-half of the entire area of the county, under crops of all kinds, the chief being clover or other artificial grasses, oats, and turnips.

The county has long been famed for its cattle. The black-poll'd and Angus breeds are considered the best, but the county also contains good short-horned cattle. Much additional grazing land has been reclaimed, and very great progress has been made in the rearing of cattle—chiefly owing to the constantly increasing demands of the English meat market. Between 40,000 and 50,000 are sent from the county every year—either in carcasses, as "dead meat," or alive by railway or steamer. Sheep and horses are also reared in considerable numbers, the former being mainly of the Leicester, the black-faced, and the Merino cross-breed. There were 160,000 head of cattle, and 140,000 sheep in the county in 1885. Aberdeen has nearly twice as many cattle as any other Scotch county, and grows three times as much oats and turnips. In the S.W. of the county is the Forest of Mar, which contains some of the finest firs in Great Britain, and is the abode of large herds of deer. Altogether there are 93,000 acres of woods in Aberdeenshire, and about 175,000 acres of deer forests. The winters, owing to the large extent of sea-coast, are comparatively mild, but the summers are usually short and cold. In the neighbourhood of Aberdeen the culture of strawberries has of late years been carried on on a very large scale, and the English market is supplied from this source long after their season is over in the south.

The fisheries along the coast are very productive—especially that of the herring—and large quantities of salmon are exported. The manufactures of the county consist

chiefly of woollen goods, cotton, linen, sail-cloth, and paper, and there are some very extensive granite quarries.

Divisions.—The county comprehends the five ancient districts of Mar, Formartin, Buchan, Garioch, and Strathbogie, which are not at present recognized for any administrative purposes. Mar, sometimes written Murr, comprehends that part of the county which lies south of the Don; it is subdivided into Braemar, Midmar, and Cromar. Formartin includes the part of the county on the coast between the Don and the Ythan, and extends inland up the right bank of the Ythan to the border of Banffshire. The district of Buchan comprehends that portion of the county which lies north and north-east of the Ythan. Garioch is an inland district, about the Urie and its feeders. Strathbogie is also an inland district comprehending the valley of the Bogie, and including part of the valley of the Deveron, near the junction of the Bogie. At present the county is divided for administrative purposes into the districts of Aberdeen, Alford, Deer or Buchan (comprehending only a part of the more ancient district of Buchan), Ellon, Garioch (more extensive than the ancient Garioch), Huntly, Kincardine o' Neil, and Turriff or Turreff. These modern districts are nearly coincident in extent with the several presbyteries of the same name.

The county of Aberdeen returns two members to the House of Commons—one for the western, and the other for the eastern division. No alteration was made in the county representation by the Redistribution of Seats Act of 1885, but an additional member was given to the borough of Aberdeen. The chief towns in the county are Aberdeen (the capital), Peterhead, Fraserburgh, Turriff, Huntly, Inverurie, Old Meldrum, New Deer, Ellon, and Alford.

History and Antiquities.—At the earliest historical period Aberdeenshire was occupied by the Tazali of Ptolemy. The south-western part of the county was probably included in the territory of the Vacomagi of Ptolemy. The Ituna of Richard of Cirencester may be identified with the Ythan. Of the most ancient period of its history Aberdeenshire contains various monuments, such as cairns, barrows, Druidical stones, and the structures sometimes called Picts' houses. There are also some ancient camps, two or three of which are supposed to be Roman.

The principal events of the middle ages and of latter days were—the battle of Cruden, in the beginning of the eleventh century, between the Scots under Malcolm II. and the Danes under Canute, afterwards king of England. In 1111 the bloody battle of Harlaw, in Chapel of Garioch parish, was fought between 10,000 Highlanders, under Donald, Lord of the Isles, and the royal forces (Lowlanders), under the Earl of Mar, in which Donald was completely defeated. In the civil war of Charles I., in 1644, Montrose defeated the Covenanters under Lord Burley not far from Aberdeen, which he entered. Monk occupied Aberdeen in 1651; and the troops of the Pretender occupied it, and levied contributions on it, in 1745.

The principal memorials of the feudal ages are the ruins of feudal castles, the most extensive being those of Kildrummy Castle, which are still an acre in extent. In 1150 it belonged to David, earl of Huntingdon, and was subsequently the seat of the earls of Mar, who were attainted in 1716. The ecclesiastical remains are very few.

Balmoral Castle, the favourite autumnal residence of her majesty Queen Victoria, is situated in Aberdeenshire.

ABERDEVINE, or Siskin (*Carduelis spinus*), is one of the Finch tribe (*Fringillidae*), which is included in the sub-order *COXIROSTRE*. It is a native of the northern regions of Europe, as Norway, Sweden, and the north of Germany, whence in severe winters it migrates southwards, visiting the British islands, sometimes in considerable flocks, associated with the lesser redpole, and

feeding upon the seeds of the birch and alder. Though this bird must be regarded rather as a winter visitant to our island than a permanent resident, yet there are not wanting instances of its breeding within our shores. The eggs are bluish white, speckled with purplish red.

The siskin or aberdevine soon becomes familiar in captivity, and utters a trifling though not unpleasant twitter; it is sometimes paired with the canary by bird-fanciers. The male is rather more than $4\frac{1}{2}$ inches in length, the top



The Aberdevine.

of his head is black, the whole lower surface is yellowish green with black streaks, and the chin and throat are black. The female is smaller than the male, grayish olive above and grayish white beneath, streaked, as in the male, with black.

ABERGAVERNNEY (the *Gobanium* of the Romans), a town in the county of Monmouth, at the confluence of the Usk and Gavernney, is beautifully situated in the valley of the Usk (the garden of Wales), and is entirely surrounded by woods and mountains. It is 14 miles W. by N. of Monmouth, and 167 from London by the Great Western Railway. There is a fine old bridge of fifteen arches over the Usk; also the remains of a castle, and of a Benedictine priory founded soon after the Conquest. The town is regularly and compactly built, and many improvements have been made in recent years. St. Mary's Church, once a fine cruciform structure, has been restored, but not improved thereby in appearance. There are several places of worship for dissenters, a Roman Catholic chapel, and a handsome lunatic asylum. A new town-hall and market-house was erected in 1873. The grammar-school was founded by letters patent of Henry VIII. Coarse flannels, boots and shoes are made, and the supply of coal and iron from the mountains has given rise to several iron-works in the surrounding district. The population of the town in 1881 was 6941; of the parish, 7886.

ABERGELE, a market town in the N.E. of Denbighshire, about 12 miles from Denbigh, and 213 from London by the North-Western Railway. The population in 1881 was 1916. The beach is good, and the place is a favourite resort for sea-bathing. There are some good inns and lodging-houses for the accommodation of visitors. Mrs. Hemans spent many of her early years here, and thus acquired that attachment to Welsh scenery and traditions which is so conspicuous in some of her poems. Abergele is, however, best known as having been, on the 20th of August, 1868, the scene of one of the most frightful railway accidents which ever took place in the United Kingdom. A portion of a goods train was detached while on an incline, and running backward, met the Irish mail train advancing at the rate of 30 miles an hour. The last of the goods waggons, loaded with barrels of petroleum oil (which burst with the concussion), smashed the engine and three first-class carriages of the mail train; the oil at once set them in flames, and thirty-three passengers were immediately burnt to such cinders that not one of them could be distinguished. Amongst them were Lord and

Lady Farnham. All the remains were buried in a common grave in the churchyard.

ABERNETHY, JOHN, surgeon, was born in London, in 1765. At the usual age he was apprenticed to Sir Charles Blick, surgeon to St. Bartholomew's Hospital, under whom he had ample opportunities of acquiring a thorough knowledge of his profession, of which he availed himself with diligence. In 1786 he succeeded Mr. Pott as assistant-surgeon to St. Bartholomew's Hospital, and shortly afterwards took the place of that gentleman as lecturer on anatomy and surgery. On the death of Sir Charles Blick he was elected surgeon in his room, and subsequently St. Bartholomew's Hospital obtained under him a reputation which it had never before acquired. In 1813 he was appointed surgeon to Christ's Hospital, and in 1814 professor of anatomy and surgery to the College of Surgeons. He died at Enfield on the 20th April, 1831.

Abernethy was one of the first surgeons who pointed out the fact that local diseases may have a constitutional origin. In a work entitled "The Constitutional Origin and Treatment of Local Diseases," he lays down and establishes this great principle—that local diseases are symptoms of a disordered constitution, not primary and independent maladies; and that they are to be cured by remedies calculated to make a salutary impression on the general frame, not by topical dressing, nor any mere manipulations of surgery. This principle influenced the entire field of surgery, and gave a great impulse to its improvement. And to this first principle he added a second, the range of which is less extensive, but the practical importance of which is scarcely inferior to that of the first—namely, that this diseased state of the constitution either originates from or is rigorously allied with derangements of the stomach and bowels, and can only be reached by remedies which first exercise a curative influence upon these organs.

The same philosophical view of the structure and functions of the human frame, which enabled Abernethy so greatly to improve the theory and practice of surgery, suggested, and at the same time armed him with the courage to perform, two operations in surgery bolder than any that had ever before been achieved, and the repetition of which has since been attended with frequent success—namely, the tying the carotid and the external iliac arteries. The announcement of the performance of these capital operations at once established his reputation as a surgeon, and increased the credit of the English school.

Great, however, as was the reputation which this distinguished man acquired as an anatomist, physiologist, and surgeon, it is probable that he owed his celebrity chiefly to his success as a teacher. Gifted with the genius to master and extend his science, he was endowed with the still rarer capacity of communicating to others in a clear, succinct, impressive, and fascinating manner whatever he himself knew.

The private character of Mr. Abernethy was blameless. He was highly honourable in all his transactions, and incapable of duplicity, meanness, artifice, or servility. His manners in the domestic circle were gentle, and even playful; he gave to those about him a large portion of what his heart really abounded with—tenderness and affection; and on his part he was tenderly beloved by his children, and by all the members of his family. In public, and more especially to his patients, his manner was abrupt and capricious, and sometimes even coarse and churlish.

A collected edition of his works was issued in 1830, and a biography, by George Macilwain, F.R.C.S., was published in 1853.

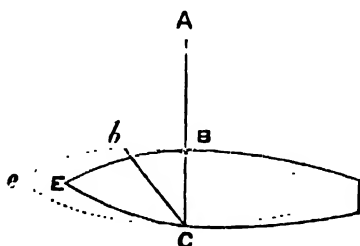
ABERRATION, in optics, is a deviation of the rays, in a pencil of light, from a single point in the axis of the pencil; the rays, after diverging from a radiant point,

being reflected from the surface of a concave mirror, or refracted in passing through a convex lens. The deviation in lenses is caused partly by the spherical form which is usually given to them, and partly by the differently coloured rays in a pencil suffering different degrees of refraction in transparent media. It is therefore of two kinds, *spherical aberration* and *chromatic aberration*.

ABERRATION OF LIGHT, an astronomical phenomenon, being an apparent alteration in the place of a star, arising from the combined motion of the spectator and of the light which brings the impression of the star to his eye. We should, however, premise, in order that the reader may not form too large a notion of aberration, that it is never so much as $21''$. Bradley, the discoverer of aberration, made its greatest value $20''$; more recent observations make it about $20'1''$.

The velocity of light is 185,000 miles (about eight times round the earth) in a second—a rapidity altogether inconceivable—so that light reaches us from the sun in 8 minutes 18 seconds. Still this has already become an appreciable delay, and when we consider the light of the fixed stars instead of that of the sun, the nearest of them is so far from the earth that the delay amounts to three years and a half. The velocity of the earth in its annual orbit around the sun is about 18 miles a second, and although this is only a very small fraction, i.e. about one ten-thousandth part of the velocity of light, yet it is sufficient to produce an appreciable effect in deranging the apparent place of the star from the place in which it would be seen were the earth at rest.

If a shower of rain is falling vertically (on a day when there is little or no wind), and we walk quickly forwards, the rain seems to slant towards us as if a breeze were



blowing in our faces; if, on the other hand, we walk backwards, the rain will drive, or seem to drive, from behind us. That is to say, the rain, really vertical, is made to appear to change its path, by our motion, into a fresh path bent towards the direction in which we are moving. Sir G. Airy illustrates this in another way:—Let a cannon ball be fired in the direction AB , and pierce the side of a ship at n , passing through the ship and emerging at c . If, during the passage of the shot across the ship, she should move onward to the dotted position, so that e is now at c , the hole n where the shot entered will have reached the position b , and any person casually observing the slantwise direction of the holes b c , would assume the shot to have been fired not directly athwart the ship's course, as we have assumed to be the case, but from ahead. The slower the ship goes, or the faster the cannon ball goes, the less aberration.

So also with the light of the stars, which occupies the place of the cannon ball in the illustration. Its apparent path is changed on account of the forward motion of the earth in her orbit, and seems to come along a path more near to that in which the earth herself is travelling. And as we only see the star by means of its light, the position of the star itself to us is continually being altered, since the motion of the earth is continual. As the earth moves

in an ellipse, with a velocity varying according to Kepler's law, it is proved that the stars appear to move in tiny circles of about $40'$ in diameter round their true positions.

It has been said that the fixed stars appear to describe circles of very small diameter; but it must be remembered that a circle (as, for example, a ring) only appears as such when seen fully in face; when seen edgewise it is a straight line, and when seen at any intermediate position it becomes an ellipse more or less flattened as it nears the edgewise or the direct view. The star's apparent path being circular is so seen by us if the star is at or near the pole (of the ecliptic), but it is seen by us as a line in the case of stars along the ecliptic, and for other stars as a more or less flattened ellipse. An important result of aberration is the proof of the velocity of light. For if we know the rate of motion of the ship in our illustration, and the angle made by the apparent and real directions, we can compute the rate at which the cannon ball must have moved. In this way we find that light (the cannon ball) moves about 10,000 times faster than the earth (the ship), that is, 185,000 miles a second.

We have hitherto considered only the case of a star which has no motion of its own; let us now take that of a planet, comet, or the moon, which moves while the earth moves. Let the planet move from A to a , and the earth from e to e , in the time which it takes the light to move from the planet to the earth. Then, by what has been said, the earth at e receives the ray Ae , which is imagined to be in the direction ne ; and if the planet had remained fixed at A , Ae would have been the aberration, or the angle contained between its true and its apparent direction. But in the meanwhile the planet has moved to a , and if light were transmitted instantaneously would appear in the direction ae . Hence aen is the aberration: that is, to the former angle the planet's motion round e , during the passage of the light, must be added or subtracted, according as the earth and planet move in the contrary or the same directions. In the case of a comet which moves with very great rapidity the derangement of its place due to aberration is often very considerable. It is generally necessary to correct observations of the places of heavenly bodies, so as to clear them from the effects of aberration.



A further source of aberration lies in the motion of the earth as it rotates daily on its axis; but since it rotates at the rate of only about $\frac{1}{3}$ of a mile in a second, whilst it revolves round the sun at the rate of 18 miles a second, the aberration from rotation is so small compared with that from revolution as to produce no sensible error.

ABERRATION OF THE EYE. See EYE.

ABERYSTWITH, a small port, market town, and municipal borough in Cardiganshire, on a kind of peninsula between the river Rheidol and the sea. It is 39 miles N.E. from Cardigan, and 244 miles W.N.W. from London by the North-western Railway. The river Ystwith, from which the town takes its name, enters the sea about half a mile from the embouchure of the Rheidol; but there is a tradition that the sea has here encroached on the land, and there may have been a town formerly at the outlet of the Ystwith. Aberyistwith was formerly defended by walls and a castle, originally founded by Gilbert de Strongbow in 1109, but they are now in ruins. The castle was besieged by the Parliamentarians, and bombarded by Cromwell. The houses are covered with the black slate of the county. Of late years the town has been much resorted to in summer for sea-bathing, and many new houses have been erected. It is sheltered from the east by a hilly background. Much of the finest scenery in North Wales is within easy reach. The Welsh University

College, an exceedingly handsome building, was opened in 1870. Aberystwith is a busy place, and in addition to its commerce and its fisheries of cod, whiting, herring, and mackerel, some woollen manufactures are carried on, and small vessels built. Silver mines were successfully worked in the vicinity in the reigns of Elizabeth and Charles I. The harbour is small, but has been improved by the erection of a pier. The number of vessels registered as belonging to the port in 1885 was 200 (26,000 tons). The entries and clearances each average 400 (28,000 tons) per annum. The imports are timber, coal, and lime; exports, lead, oak-bark, flannel, and corn. The population of the borough in 1881 was 7073; of the parish, 6703. Aberystwith is in the Cardigan district of boroughs.

ABEYANCE, a term in English law implying that a freehold inheritance, dignity, or office is not vested in any one, but is awaiting the rightful possessor. This doctrine of the suspense of the freehold or of the inheritance, is repugnant to the general principles of the tenure of land in England. By the old law it was always necessary that some person should be in existence as the representative of the fee or freehold, for the discharge of the feudal duties, and to answer the actions which might be brought for the fief; and thus the maxim arose that the freehold of lands could never be in abeyance. Still it was admitted that both the inheritance and the freehold might in some cases be in abeyance. Thus, in the case of glebe lands belonging to parsons, and of lands held by bishops and other corporations sole, it is said that the *inheritance* must always be in abeyance, as no one can, under any circumstances, be entitled to more than an estate for life in these lands; and during a vacancy of the church it is said that the *freehold* is in abeyance, for there is then no parson to have it, and it is said that the freehold cannot be in the patron, who, though he possesses a right to present to the benefice, has no direct interest in the land annexed to it. In the law of Scotland there is no place for abeyance—it being a principle that the fee or right of possession must be vested in some one.

Titles of honour are also sometimes said to be in abeyance, which occurs when the persons next in inheritance to the last possessor are several females or co-parceners. In this case the title is not extinct, but is said to be in abeyance; and may be revived at any time by the king. Several instances of the exercise of this prerogative are on record both in ancient and modern times. But the correct doctrine appears to be that in this supposed case of a dignity it reverts to the crown, which may grant it again. (For further information, see *Cameys' Case*, 5 Bing. *New Cases*, 751; *Coke upon Littleton*, 165; *Cruise, Digest*, i. 52.)

ABIES is a genus of cone-bearing trees of the family **ABIECTINEÆ**, belonging to the order **CONIFERÆ**. This genus is distinguished from the other genera of **Abietinæ**, by its narrow flattened leaves arising singly from around the stem—not by twos, or threes, or a greater number—from out of a membranous shrivelling sheath; by the staminate flowers being solitary in the axils, the cones erect, the scales falling with the seeds, and the subtending bracts being conspicuous on the outer surface of the scales.

Abies Picea, the Silver Fir, is a native of the mountains of the middle and south of Europe, and also of the Caucasus, the Ural, and Altai Mountains. It is found in stony, dry, exposed situations. Its favourite district seems to be on the Pollino and in the forest of Rubia, near Naples, where it is found in all its grandeur, often growing from 180 to 150 feet in height, and richly meriting the name *pulcherrima* (most beautiful), applied to it by Virgil. This tree is readily known by its leaves having their points all turned towards the sky, and being silvery-white underneath (whence the name Silver Fir), as well as by its long,

erect, stalkless cones, of a greenish-purple colour, bristling with reflexed taper points of the bracts on the outer surface of the scales. It is the *sapin* of the French. Planks of indifferent quality, on account of their softness, are sawn from its trunk, but the wood is durable under water. It yields Burgundy pitch and Strasburg turpentine. For its successful cultivation in this country it requires strong land, such as will suit the oak, and a sheltered situation; it will then become a very large tree.

Abies balsamea, the Balm of Gilead or Balsam Fir, is found, along with *Picea nigra* and *alba* (the Black and White Spruce Firs), in the coldest parts of North America, but always as individuals, and never in large masses. The English name was given in consequence of a resemblance between the clear transparent greenish-yellow turpentine, which is obtained from numerous cysts in its bark, and the balm of Gilead of the shops. This turpentine is commonly known under the name of *Canada balsam*, and is useful for mounting microscopic objects.

Abies Webbiana, Webb's Fir or King Pine, named after Captain Webb, who first discovered it. This remarkable species attains the height of 80 or 90 feet, with a diameter near the ground of 3 or 4 feet. Its wood is compact, and in India is used by plane-makers. It inhabits the colder regions of northern India, and is found among a flora that is more Siberian in its character than Indian.

Abies religiosa, the Sacred Silver Fir, is an inhabitant of Mexico, at an altitude of 8000 or 9000 feet above the sea. It is a noble tree, rising to a height of 100 to 150 feet, and is 6 feet in diameter at the base. The cones are similar to those of the Silver Fir, but much smaller.

ABIETINÆ is a family of the **CONIFERÆ**, which includes, according to Benthams and Hooker, the genera **PINUS**, **CEDRUS**, **LARIX**, **PICEA**, **TSUGA**, **PSEUDOTSUGA**, and **ABIES**. This group is distinguished from other conifers by the scales of the female cone being double, with two inverted ovules at the base of each.

The name **Fir** is very loosely used, sometimes to designate the whole group, sometimes the whole with the exception of **Pinus**, or again only the last four genera. The name appears in all the Teutonic languages, and therefore carries us back to the time when the Celts, the Germans, and the Scandinavians were still one people, with one common tongue. Great as is this stretch of time from an historical point of view, it is as nothing when compared with the lapse of ages since the first forests of fir trees existed, for these are found fossil many geologic periods before the appearance of dicotyledonous trees, such as the oak and beech. Remnants only of this "forest primeval" exist at the present day, but they help us to appreciate its extent before man appeared and began to clear the ground. Some of the "Pine Barrens" in North America stretch for 500 miles.

Some of the **Abietinæ** are giants in stature, the Douglas spruce often reaching a greater height than 300 feet; while, again, the common spruce dwindles down at great altitudes to the pigny growth of 1 foot.

ABINGDON (formerly *Abendon*—town of the Abbey), an ancient town and borough in Berkshire, is pleasantly situated at the junction of the Ock and the Thames, 60 miles from London by the Great Western Railway. The streets are spacious, diverging from the market-place; the supply of water is good. The market-house is an elegant structure. There are two churches, and chapels for Baptists, Independents, Quakers, Wesleyans, and Roman Catholics. A memorial of the Prince Consort, a very handsome structure surmounted by a statue, was erected in 1864. There is a free grammar-school well endowed, founded in 1563, and for which a

handsome new building was erected in 1870, and some other foundations for the purposes of education. The corn-market is large. There is an extensive clothing factory in the town, and trade is also carried on in malt. Abingdon formerly returned a member to parliament, but was deprived of separate representation in 1885. The population of the municipal borough in 1881 was 5676. A monastery was built at Abingdon as early as 680. This was destroyed by the Danes in 871, but was afterwards rebuilt. The term "Abingdon law" arose in consequence of Lord Essex—who successfully held the town against Charles I.—having put every Irish prisoner captured in assaults on the town, in 1644 and 1645, to death without trial.

ABIOTENESIS. See SPONTANEOUS GENERATION.

ABJURATION, OATH OF, was an oath which asserted the title of the present royal family to the crown of England. It was as follows:—"I, A. B., do swear that I will be faithful and bear true allegiance to Her Majesty Queen Victoria, and will defend her to the utmost of my power against all conspiracies and attempts whatever which shall be made against her person, crown, or dignity; and I will do my utmost endeavour to disclose and make known to Her Majesty, her heirs and successors, all treasons and traitorous conspiracies which may be formed against her or them; and I do faithfully promise to maintain, support, and defend to the utmost of my power the succession of the crown, which succession, by an act intitled An Act for the further Limitation of the Crown and better securing the Rights and Liberties of the Subject, is, and stands limited to the Princess Sophia, electress of Hanover, and the heirs of her body, being Protestants, hereby utterly renouncing and abjuring any obedience or allegiance unto any other person claiming or pretending a right to the crown of this realm; and I do declare that no foreign prince, person, prelate, state, or potentate, hath or ought to have any jurisdiction, power or superiority, pre-eminence or authority, ecclesiastical or spiritual, within this realm; and I make this declaration upon the true faith of a Christian." The words "upon the true faith of a Christian" were omitted in the case of a Jew, and provision was made for affirmation by Quakers. A special oath was administered to Roman Catholics, in which they were required to declare that it was not an article of their faith, and that they renounced, rejected, and abjured the opinion that princes excommunicated or deprived by the pope, or any other authority of the see of Rome, might be deposed or murdered by their subjects, or by any person whatever. This was for a long time considered objectionable and needlessly offensive to Roman Catholics, and in 1871 all previous acts on the subject were repealed, and a uniform oath is now administered to all members of Parliament in both Houses. The form of the oath is—"I, A. B., do swear that I will be faithful and bear true allegiance to Her Majesty Queen Victoria, her heirs and successors, according to law. So help me God."

ABO (*pron. ū'bo*), a seaport, and the chief town of the district of Abo, in the Russian province of Finland, is situated on both sides of the Aurajoki river, a short distance above its outfall into the Gulf of Bothnia. Abo formerly had a well-attended university; but a fire which happened in 1827 destroyed 780 houses, together with the buildings of the university, and its library of 40,000 volumes. The university, which was originally founded in 1540, was then removed to Helsingfors. Abo is, however, still the seat of an archbishop, and has a cathedral. Tobacco, sailcloth, leather, and linen are manufactured, and considerable trade is carried on in timber and tar. Shipbuilding also forms one of the industries. The harbour is excellent. Population, 20,000. In 1743 peace was concluded at Abo between Sweden and Russia, a great

part of Finland being then ceded to the latter power, which by a subsequent treaty, in 1809, obtained the whole.

ABOLITIONISTS, a party in the United States who long advocated the total abolition of slavery. The term comprised a large portion of the intelligent inhabitants of the Northern States.

ABOMEY or **AGBOME**, the capital of Dahomey, in West Africa. It is a clay-built town, with walls and gates, and has frequently been the scene of human sacrifices. The king has three palaces; and trade is carried on in gold, ivory, and palm-oil. The population is estimated at about 40,000.

ABORIGINES, a term by which we sometimes denote the primitive inhabitants of a country. Thus, to take one of the most striking instances, when the continent and islands of America were discovered, they were found to be inhabited by various races of people, of whose immigration into those regions we have no historical accounts. All the tribes, then, of North America may therefore be considered as aborigines. We can, indeed, since the discovery of America, trace the movements of various tribes from one part of the continent to another; and in this point of view, when we compare the tribes *one with another*, we cannot call a tribe which has changed its place of abode aboriginal, with reference to the new country which it has occupied. The North American tribes which have moved from the east side of the Mississippi to the west of that river are not *aborigines* in their new territories. But the *whole mass* of American Indians must be considered as *aboriginal* with respect to the rest of the world. The English, French, Germans, and others who have settled in America, are, of course, not *aborigines* with reference to that continent, but settlers or colonists.

The term *aborigines* first occurs in the Greek and Roman writers who treated of the earlier periods of Roman history. It means "without origin."

ABORTION, in criminal law, may be defined as the crime of administering to a pregnant woman any medicine or drug, or the use of any surgical instrument or mechanical means for the purpose of procuring a miscarriage. By the 24 & 25 Vict. c. 100, s. 58, the offence is made felony, and is punishable by penal servitude for life, or for not less than three years, or imprisonment for any term of not less than two years. When the attempt causes the death of the woman it becomes murder, and renders those implicated liable to the extreme penalty of the law. It is, however, sometimes necessary in the practice of medicine to induce premature labour with the view of saving life, and such interference is of course justifiable.

ABOU-HANNES. See **INNIS.**

ABOUKIR. The castle of Aboukir in Egypt is about 13 miles N.E. of Alexandria. It stands on the extreme north-eastern point of the low barrier of limestone rocks which form the breastwork of the coast of Alexandria. It marks, in fact, the extreme eastern limit, along the northern coast, of the rocks of the African continent, being immediately followed by the old Canopic mouth of the Nile and the alluvium of the Delta. The small island, which lies near Aboukir Point, bears evident marks of having once been larger than it is at present. This little spot is now commonly called Nelson's Island, in commemoration of the victory which the English admiral obtained over the French fleet, under Brueys, in Aboukir Bay, 1st August, 1798. Sir Ralph Abercromby landed near here in 1801, and defeated the French army, after a sanguinary conflict.

ABOUSAMBUL. See **IPSAMBUL.**

ABRACADABRA, a word of Oriental origin, generally thought to be the name of a Persian or Syrian deity. It was formerly of high repute as a charm, and was regarded as being highly efficacious in the cure of fever

and ague. It was written on paper or parchment as many times as it had letters, omitting one letter each time, thus—

A B R A C A D A B R A
 A B R A C A D A B R
 A B R A C A D A B
 A B R A C A D A
 A B R A C A D
 A B R A C A
 A B R A C
 A B R A
 A B R
 A B
 A

and was then worn round the neck. It is now only used in contempt to express any high-sounding but useless formula.

ABRAHAM or **ABRAM**, the ancestor and founder of the Israelite race, was the eldest son of Terah, a Shemite, and was born at Ur of the Chaldees, a district in the north-east of Mesopotamia, probably about 2000 years before the Christian era. He journeyed with his father westward to Haran, where Terah died. He then resumed his journeyings, moving towards the Holy Land, and henceforward appears to have pursued a nomadic life in Palestine and the surrounding districts. At one period he reached Egypt, where he dwelt for a time, but returned again to Canaan. He had married in Ur his half-sister Sarai, afterwards Sarah, and had as secondary wives Hagar and Keturah. By Hagar he had one son, Ishmael, and by Keturah six sons, whose names are given Gen. xxv. 2. Late in life a son was born to Sarah, and in him the succession was vested, his brothers being provided with separate establishments, and sent away into other districts. The various incidents of his life are recorded in the book of Genesis, the 11th to 25th chapters inclusive. The life of Abraham is one of the most interesting and valuable of the Old Testament records. His courage, integrity, generosity, and hospitality show him to have been a high-minded man, worthy of the respect and honour in which he was held by neighbouring chiefs and peoples. In the history of religious thought he takes a still higher place. His lofty conceptions of God, and freedom from idolatry in the midst of polytheistic peoples, entitle him to respect and veneration; and the great care taken by him to perpetuate the memory of the truths to which he had attained has been of inestimable service to humanity. His name is held in honour by all the Mohammedan nations of the East, by whom he is spoken of still as El Khalil, the friend of God. The Arabs, like the Jews, claim to be his descendants, and attribute to him the building of the Kaaba at Mecca.

ABRAHAMITES is the name given to a sect of Deists which arose in Bohemia about 1782. They endeavoured to make their creed as simple as they supposed Abraham's to have been, and though they professed to be followers of John Huss, they held no Christian doctrine beyond that of the unity of God. They declined to join either Jewish or Christian sects, and the Emperor Joseph II. refused them toleration, and scattered them in various parts of his dominions. Some became converts to Roman Catholicism, and others were martyred.

ABRAHAM-MEN, a class of sturdy vagrants who formerly roamed about the country pretending to be insane, and obtaining the means of living by begging, or by working upon the fears of the weak. Tom o' Bodlam was another name given to the same class. They were common during the reign of James I., and existed as late as the time of the Commonwealth; while the slang terms, "an Abram cove," and "to sham Abraham," were in use till a recent period.

ABRANTES, a fortified town of Portugal, in the province of Estremadura, on a hill near the Tagus, 74 miles north-east of Lisbon. It is an important military position, and gave the title of Duke of Abrantes to Marshal Junot. It was surrendered to the British at the convention of Cintra in 1808. The population in 1882 was 6000. There is also a town of the same name in Brazil.

ABRAXES STONES were stones used in the middle ages as talismans. They were so called from having the Greek word Abraxes engraved on them. The numerical value of the letters in this word is 365—the supposed number of spirits in the world. In Persian mythology the deity Abraxes presides over 365 impersonated virtues.

ABRUS is a genus of plants belonging to the order LEGUMINOSÆ. The seeds of *Abrus precatorius*, called "crabs-eyes," are well known. They are roundish, of a bright scarlet colour, with a black mark where they were attached to the pod. This plant is of twining habit, with pale purple flowers. Originally a native of India, it is found now in most tropical countries. A narcotic principle exists in the seeds, and the roots possess the properties of the liquorice root. In India the seeds are called "rati," and are strung together for necklaces; they are about a grain each, and are used as weights by the native druggists and jewellers.

ABRUZZO, the former name of three districts of the kingdom of Naples, but which were divided into the provinces of Aquila, Chieti, and Teramo, after the incorporation of that kingdom with Italy.

ABSCESS, the name generally given to a painful and inflamed swelling, which, after a certain period, terminates by a discharge of pus or matter. This may appear in any part of the body, and is generally the result of an impure state of the blood or of weakness brought about by disease or want of proper food. It may be either acute or what is known as the chronic or cold abscess. The symptoms of the acute inflammatory abscess are generally a hot and painful swelling, covered by a stretched skin, often of a shiny or bright-red appearance, attended by throbbing, which becomes worse as the swelling increases in size. After a time the centre becomes softened, and ripens or breaks down into pus, and finally bursts and discharges the collected matter. The discharge is profuse at first, and the fluid is thick and yellowish, but as the abscess contracts, it becomes clear and thin. The best treatment to adopt during the early stages of an abscess is the repeated application of a mixture composed of equal parts of glycerine and extract of belladonna, which should be thickly smeared over the part, and covered with a hot linseed-meal poultice. This will tend to allay the painful throbbing of the part, and will hasten the ripening or breaking. Of internal medicines sulphide of calcium in the form of powders or pills is generally of great service, and when taken during the early stages will frequently prevent the formation of matter. Another useful medicine is the extract of belladonna, of which the dose is usually from five to ten drops of the tincture, in a little water, three or four times a day. When an abscess has discharged, either by bursting or the aid of the lancet, it should not be pressed, as this may increase the inflammation; but a small poultice should still be continued until the discharges become clear and thin; it may be replaced by lint dipped in cold water, and covered with oilskin or oil silk; or the lint may be saturated with a lotion made of a teaspoonful of tincture of the common marigold diluted with three tablespoonfuls of water. The cure of abscess is greatly promoted by good nourishment and easily-digested food.

ABSENTEE. This is the first subject, in alphabetical order, that comes under our notice in the science of political economy. In the whole compass of that science there is no subject which presents more difficulties in the

way of popular explanation, if we view it purely as a scientific question. An absentee, as the term is now used, is a person who derives his income from one country, but resides in another country, where he expends that income. The common voice of mankind says that this is an evil and an injustice. It points to lands imperfectly cultivated, to labourers inadequately employed, to ruined cottages, to uneducated children, and it proclaims that these things would not be if the proprietor resided upon his estates. He does not choose to reside upon his estates; he would rather derive less from his estates, having the liberty to spend the revenue as he pleases. There is no law to prevent him but the great law of moral obligation, which he may obey or not. The public inconveniences of a positive law to bind his person to his property would far outweigh its public good. But the common sense of mankind is right; and the day of retribution comes when neglect goes forward into general destitution. Then the capital which has been abstracted from its fertilizing local influence is forcibly driven back, to prevent misery becoming utter ruin. Such results have been more than once shown in large districts of Ireland. The political economists of every class cannot shut their eyes to these facts; but some say that these facts lie beyond the boundaries of their science: they belong to the moralist to explain. They consent only to look at the absentee in his abstract capacity of a capitalist: they admit that it would be better for his own local connections and dependents that he should not be an absentee; but they are prepared to prove that it is a matter of indifference to the country in general; that the wealth of the country is neither increased nor diminished whether he spend his rents in Dublin or in London—in London or in Rome. Even in this point of view these economists have few supporters. Popular opinion, without pointing to the extreme moral evils of a non-resident landed proprietary, maintains that the amount of revenue which the landlord spends in a foreign country is so much clear loss to the country from which he derives his property, and so much encouragement withdrawn from its industry; and that he ought therefore to be compelled to stay at home, instead of draining his native land for the support of foreign rivals. Some political economists reply that this is a popular delusion, and that, in point of fact, the revenue spent by the landlord in a foreign country had precisely the same effect upon the industry of his own country as if his consumption took place at home. The truth, perhaps, lies between these counter-opinions. The argument of the economists runs thus: all consumers residing in their own country, and landlords amongst the number, purchase many articles of foreign production which have been exchanged for the productions of their own country. In purchasing such foreign productions they stimulate native industry. The consumption of an English resident in a foreign state, they go on to say, produces, in principle, the same indirect effects upon English industry as his partial or entire consumption of foreign goods in England. His consumption of foreign goods abroad is equivalent to an importation of foreign goods into England; and that consumption, it is said, produces a correspondent exportation of English goods to the foreigner. It may be true that the foreigner requires some additional goods from England in consequence of the domiciliation of the English absentee; but does he require as large an amount of English goods as the total sum which the Englishman expends? Unquestionably not. There are large differences between the exchanges of commerce and the smaller exchanges of domestic life. The profit of the foreign retailers, of the foreign domestic servants, of the foreign landlord of the absentee's house, remain at any rate to the foreign country, and are so much abstracted from the absentee's country.

By abstracting the profit of these smaller transactions, the surplus that becomes accumulation remains in the shape of new capital to the foreign country. New capital in a country is created by the slow aggregation of minute individual profit. Profit is like the nitrogenous substances in the food of men. Individuals may exist feebly and miserably without profit from their labour—that is, their labour may replace what they consume, and leave no surplus—as individuals may drag on existence upon the innutritious root which imperfectly replaces their ordinary exhaustion, and leaves nothing for development or extraordinary exertion. But the wealth of nations cannot be sustained without surplus produce—without profit; as the health of communities cannot be sustained without the food which builds up the body as well as keeps alive the animal heat. Rent is really profit under another name. It is, in most cases, the largest portion of the surplus produce of the soil. It is that surplus which constitutes a natural fund for social improvement. The absentee who withdraws that fund from its local appropriation to make it the source of new profit to a foreign country, to a certain extent must take away what he ought to contribute to the accumulation of his own district and his own country.

It was estimated by Dean Swift that a full third of the rental of Ireland was transmitted to landlords resident in England, besides vast sums carried out of the country by other Irishmen of the upper classes; and according to a return published in 1880, it appeared that more than a fourth of the valued rental of Ireland was sent out of the country to proprietors who never resided there. Such landlords, of course, only deal with their tenants through agents, who are often compelled to act somewhat harshly in the interests of their principal; and, of course, there is no community of sentiment whatever. In fact, absenteeism has ever been one of the main obstacles to the prosperity of Ireland. In Great Britain, and especially in Scotland, where it has become much too common, its evil effects are mitigated by the independent spirit of the people, and the existence of large manufacturing towns. The reason why so many Irish proprietors reside in England or on the Continent is that life is more agreeable, more stirring, and, we must add, more secure; for the agrarian outrages, the crimes committed by the secret societies, and the evil influence of professional agitators exemplify the causes which swell the number of proprietors "rarely or ever resident in Ireland."

An absentee tax of 4s. in the pound was levied in Ireland on the incomes and pensions of absentees, from 1715 to 1753. An unsuccessful attempt was made to impose a tax of 2s. in the pound both in 1773 and 1783.

ABSINTHE, a very intoxicating liqueur, of a bitter aromatic taste, made by the distillation of an infusion of wormwood and other herbs in strong alcohol, to which a proportion of essential oil is added. The chief seat of its manufacture is in the canton of Neuchâtel, in Switzerland, though there are many distilleries in France. It is principally consumed in the latter country, but large quantities are also exported. It is frequently adulterated, and the materials used for this purpose are often of the most pernicious character. It came into general use in France soon after the Algerian War (1844-47), and the habit has spread until it has become a serious evil. When taken in excess it causes indigestion, mental excitement, and loss of brain power, which ultimately leads to insanity. In small doses its effects are not so marked; but its habitual use, even in small quantities, proves injurious to health. Its use is prohibited both in the army and navy of France.

ABSOLUTE is a term in logic and metaphysics. In logic it is used in opposition to *relative*. "A name," according to John Stuart Mill, "is said to be relative

when, over and above the object which it denotes, it implies in its signification the existence of another object, also deriving a denomination from the same fact which is the ground of the first name." Father, son; cause, effect, are relative terms. Their characteristic property is, that they are always given in pairs. An absolute name is a non-relative name, as *man*. Some logicians do not allow the use of the term *absolute*, asserting that all names have their correlatives; thus, man has the correlative names, woman, boy, brute, according to the different relations contemplated.

In metaphysics, it has been said that though relation exists, there must still be something unrelated, above all relation—an absolute. It is pointed out, in opposition to this, that the act of knowledge always includes two things: there is always a transition from one state to another; we cannot know a present state *hot* without having passed from a colder state, and having discriminated the one from the other. And secondly, knowing is itself a relation between a subject-mind and an object, or extended world; we know mind and matter by mutual contrast. Ferrier unites these two facts, subject and object, and calls the sum the absolute. Kant denies the absolute or unconditioned as an object of knowledge, but admits it conceivable, as an idea regulating the intellectual experience of the mind.

ABSOLUTION, a term employed in Roman law to signify acquittal, but which was adopted by the Christian Church, and is now only used in an ecclesiastical sense. In the earliest times it was employed to denote the forgiveness and readmission of members who had been excluded from the church for open sin, and who had made public confession and performed the penance laid upon them by the elders of the congregation. It was always given in public, and the presence and assent of the congregation were regarded as being necessary to its efficacy. In the fourth century the bishops began to exercise the power of giving absolution without consulting the congregation, and the practice of private confession was established, which gradually obtained complete ascendancy, and was made imperative by a decree of the fourth Lateran Council (1215). By this council confession and its attendant absolution were extended to all sins whatever, and absolution was made to imply not only forgiveness on the part of the church, but forgiveness in the sight of God.

The formula which had previously been used, "*Dominus absolvat te*," was changed into "*Ego absolvo te*," and the Council of Trent expressly condemned the doctrine that the priest has not power of himself to absolve from the guilt of sin. The Greek Church still uses the primitive form. At the Reformation the Church of England retained the use of a similar formula, as may be seen from the Order for the Visitation of the Sick, where the minister is instructed, should he be desired, to give absolution, using the words, "I absolve thee from all thy sins, in the name of the Father, and of the Son, and of the Holy Ghost." By the free evangelical churches of England the practice of confession is altogether rejected, and the power of giving absolution is also denied.

ABSORPTION is that process by which fluid nutritive material is taken into the living body—either animal or vegetable. It depends on the phenomena known as *Endosmosis* and *Exosmosis*—the passage of fluids inwards and outwards through membranes or cell-walls, which varies with the nature of the fluid on each side, the character of each surface, and the molecular structure. Different fluids have different powers of diffusion; the low diffusibility, for instance, of albumen, as compared with the high diffusibility of urea, tends to the retention of the serous fluids within the tissues, and to the passing out of urea. If an experiment be made with the mucous membrane of the stomach of a dog or rabbit, with alcohol on

one side and water on the other, it will be found that when the water is placed on the inner (or mucous) surface, the passage of water takes place more than twenty times as fast as when it is placed at the outer (or muscular) surface. Absorption is also facilitated by the absence of distension in the tissues or canals towards which the flow takes place, by a certain rise of temperature, by a large proportion of vessels in the tissues, and the motion of the blood through them.

Absorption in Animals takes place after the food has been changed into the nutritive fluid by the process of digestion. Among the lower Invertebrates this material percolates into the tissues surrounding the digestive cavity, and through them into those more remote; or it passes into the visceral cavity, and thence into the tissues, or directly by means of veins. In the Vertebrates the walls of the alimentary canal do not allow the passage of the nutritive fluid by endosmotic action, but absorption takes place not only by the minute blood-vessels situated on the coats of the intestine, but also by a special set of absorbent vessels, called the "lacteals," from the milky appearance of the chyle which has passed into them. Thus, while the blood-vessels are the principal channels of absorption, the lacteals are specially set apart for the conveyance from the intestine of fatty matters suspended in albuminous fluid. Effete matters are absorbed by the blood-vessels, and carried away for elimination. Thus, the carbonic acid is removed by the veins to the lungs.

Absorption in Plants.—The growth of the cells, which are the elementary constituents of plants, is always accompanied by the absorption of water, and this leads to a movement of water through plants sometimes for a considerable distance. Water, again, is required to supply hydrogen to the organs of assimilation—the leaves—in order to produce the organic compounds, and also to dissolve the food materials laid up in reservoirs, such as tubers, when these are needed for quick growth in spring. With the exception of some plants, such as those growing in water, and the cacti, which are protected by the nature of the epidermis, all plants lose a large proportion of the water of their cell-sap by evaporation through the leaves, and this has to be made good by absorption through the roots. It has been proved by experiment that this movement of water takes place through the cell-walls of the woody tissue of the stem, and it is noticeable that the development of woody tissue depends upon the amount of water passing through the plants from the roots, which in its turn depends upon the amount of evaporation-surface provided by the leaves. The wood of the oak and other dicotyledons increases year by year, *pari passu*, with the increase in the number of the leaves; but in monocotyledons generally—in palms, for instance—the crown of leaves does not increase much, and consequently there is scarcely any increase in the size of the stem. In the lowest members of the vegetable kingdom the whole surface has the power of absorption. The higher fungi (e.g., *AGARICS*) take in nourishment by means of the network of fine threads (*mycelium*) which branches among the decaying matter upon which it feeds. In mosses the absorption takes place by the leaves as well as by the slender threads, which take the place of the true roots of flowering plants. We find similar objects of absorption in the higher flowerless plants. In most flowering plants we find true roots, which take up that part of their food which exists in the soil. See **FOOD**, **LEAF**.

ABSORPTION OF HEAT AND LIGHT.—If two pieces of wax are exposed to the action of heat from a fire, or other hot body capable of melting them, and if a plate of glass be placed between the hot body and one of the pieces of wax, it will be found that this piece takes a much longer time to melt than the other; and

moreover, if the temperature of the glass be tested before and after the experiment, it will be found that the glass has become hotter. All the rays of heat, then, do not pass through the glass, some of them in their passage being used to heat the glass: the glass has *absorbed* some of the heat-rays. The experiment may be continued with plates of ice and rock-salt, and it will be found that none of the wax is melted behind the ice, but that the rock-salt absorbs very little heat. It has been calculated that out of every 100 heat-rays passing through rock-salt only eight are absorbed, while under like circumstances seventy-six are absorbed by glass, and the whole by ice.

Colour is due to the absorption of different rays of light. "Natural bodies possess the power of extinguishing, or, as it is called, *absorbing* the light that enters them. This power of absorption is *selective*, and hence, for the most part, arise the phenomena of *colour*. When the light which enters a body is *wholly* absorbed, the body is black: a body which absorbs all the waves equally, but not totally, is gray; while a body which absorbs the various waves unequally is *coloured*. Colour is due to the extinction of certain constituents of the white light within the body, the remaining constituents, which return to the eye, imparting to the body its colour" (Tyndall). Light passed through a red screen will have the blue rays absorbed, and the red rays which pass out will pass through a second red screen without being much diminished. In just the same way heat-rays passing through a screen will be so sifted that they will be more easily able to penetrate a second screen of the same material. This *selective* absorption of heat and light rays is very evident in gases. For instance, the vapour of sodium is transparent for every kind of light except for that from a salt flame.

Air is practically transparent to the sun's rays, but when these, by contact with the surface of the earth, are changed into dark heat-rays, the aqueous vapour in the atmosphere prevents their escape by radiation into space.

ABSTINENCE (from *abstinere*, to abstain). The term abstinence signifies a total or an excessive privation of food. It has been shown [see ANSOURTOS] that the constituent matter of the body is in a state of continual change; that old particles are constantly taken up and carried out of the system, while new particles are as regularly deposited in their room to repair the loss. The source of these new particles is the aliment or food; but a second office is performed by the aliment scarcely less important than that of furnishing new matter for the renovation of the system. All the organs of the body are excited to the performance of their functions by certain external agents, which are called stimulants, such as air, water, heat, and so on; but of these stimulants the aliment is among the most indispensable and the most powerful. Upon the quantity and quality of the aliment depend the quantity and quality of the blood; and upon the quantity and quality of the blood depends, in a great measure, the energy of all the functions of all the organs. Any material change in the diet must necessarily produce a great impression on the system, and life can be maintained only for a short period under the total privation of food.

It is a powerful influence of abstinence on the system, it is one of becoming a most energetic remedy in various diseases. When the mass of the fluids and solids of the body is too abundant, abstinence is capable of reducing them to almost any extent that can be required; and if the abstinence be judiciously commenced and conducted, not only is it unattended with any diminution of the strength or injury to the health, but it contributes to the improvement of both. Numerous instances are on record which place this fact beyond question.

It is curious, and it is highly important to bear in mind, that abstinence and excess produce symptoms so nearly alike, that it often requires the utmost care and sagacity on the part of the physician to distinguish them; and as the one requires opposite remedies from the other, a mistake may be fatal, and must be injurious.

It is the common belief that abstinence is conducive to longevity, and many stories are on record which are conceived to establish the truth of this opinion. It is stated, for example, that the primitive Christians of the east, who retired from persecution into the deserts of Arabia and Egypt, lived healthfully and cheerfully on twelve ounces of bread per day, with mere water; that with this diet St. Antony lived 105 years; James the Hermit, 104; Arsenius, tutor of the Emperor Arcadius, 120; St. Epiphanius, 115; Simeon the Stylite, 112; and Romanid, 120. The evidence for these instances of longevity is not, however, altogether satisfactory.

ABSTINENCE SOCIETIES. See TEMPERANCE.

ABSTRACTION is an act of the mind, by which it considers a certain attribute of an object, or several objects, by itself, and without regarding any other attributes which the object or objects may happen to possess. Thus, if we see ink, pitch, ebony, and a negro, we see that these objects have in common the attribute of blackness; and this quality we can *draw off* or *abstract* from the various other attributes which they respectively possess; and consider it separately and independently of anything else. In like manner we can consider any attribute of a single object, such as of the sun or moon, without attending to its other attributes; thus we may contemplate the magnitude of the sun without attending to its heat, light, &c.; so we may contemplate the light of the moon without attending to its magnitude, the inequalities of its surface, &c. All names of classes of things, inasmuch as the individual members can never be identical, are formed by a process of abstraction. Thus, when we think of a ship or a house, we pay no attention to the materials, colour, shape, size, construction, convenience, or beauty of the ship or house, but we give the one name to any dwelling of man built by regular artificers, and the other to any vessel with a deck and masts to sail on the sea. Any object which possesses these attributes we call a ship or a house; though there cannot be any ship or house which possesses *only* those attributes, and is not also of a certain colour, size, shape, &c.; but these incidental qualities we leave out of our consideration in referring any object to the class of houses or ships.

From these remarks it is evident that abstraction, being a merely arbitrary act of the mind, by which a certain attribute is considered apart from any other attributes with which it may happen to be associated, does not represent to us images or notions to which there is anything corresponding in the nature of things; there is nowhere an abstract man or tree, which has no colour, dimensions, or other incidents not entering into the abstract notion signified by those general terms. Whenever we recognize in any object those peculiarities which we consider as characteristic of a certain class, we refer it to that class, without taking any heed of the other attributes with which they may happen to be combined.

The circumstances of there not being any sensible object, or any conception of our mind, which we can imagine to ourselves without its attributes, has given rise to considerable perplexity on the subject of abstraction. For instance, when we think of a horse, we represent to ourselves an animal of a certain colour, shape, and size; though we should equally give the name of horse to an animal similar in other respects, but of different colour, shape, and size. So, when we think of a plane triangle, although a triangle is any plane figure bounded by three straight lines, yet we cannot help representing

to ourselves a triangle which is either right-angled, or acute-angled, or obtuse-angled, or equilateral, or scalene. The truth is, that the process by which the mind abstracts is, that it conceives or represents to itself the object of thought as an individual of its class, together with certain particular attributes which must belong to all individuals; and it considers, apart from the rest, only that attribute which is required for the matter in hand. Thus, if it is a question whether a newly discovered skeleton is that of an animal belonging to the class of elephants or of deer, the comparative anatomist calls to his mind an elephant or deer, such as actually exists, but considers only the structure of his bones; and if there is a close agreement in this respect he pronounces the skeleton to have belonged to one of those classes. So, likewise, when a mathematician, by means of a figure described on paper, proves that the square of the hypotenuse equals the sum of the squares on the other sides of a right-angled triangle, although the image in his mind is that of a triangle of a definite size, yet he considers only the relation of the sides and angles, without paying any attention to the length of the sides.

John Stuart Mill, in the portion of his "System of Logic" in which he considers the *operations subsidiary to induction*, devotes a chapter to abstraction, first referring briefly to various theories with respect to abstract ideas, and then continuing with its more practical application in the region of logic. "Whether the idea called up by a general name is composed of the various circumstances in which all the individuals denoted by the name agree, and of no others (which is the doctrine of Locke, Brown, and the Conceptualists); or whether it be the idea of some one of those individuals clothed in its individualizing peculiarities, but with the accompanying knowledge that those peculiarities are not properties of the class (which is the doctrine of Berkeley, Mr. Bailey, and the modern Nominalists); or whether (as held by Mr. James Mill) the idea of the class is that of a miscellaneous assemblage of individuals belonging to the class; or whether, finally, it be any one or any other of all these, according to the accidental circumstances of the case, certain it is that *some* idea or mental conception is suggested by a general name, whenever we either hear it or employ it with consciousness of a mean-

Comparison and abstraction, then, are always *ad*, as preliminary operations of the mind, before any induction can be made. In tracing the resemblances between the natural phenomena and tracing abstract ideas, the mind proceeds by gradual steps, comparing in the first place two objects together. If they be found to possess any common properties these are noted, and the conception thus formed shows already a first stage of abstraction. When a third object presents itself it is compared, not with those previously examined, but with the general conception which has been arrived at by means of the comparison. When, for example, we recognize any unknown object to be an animal, we do so, not by comparing it with other individuals, but with the general notion of an animal existing in our minds; though this notion has itself been derived, in the first instance, from the examination of particular cases. In this way general conceptions or ideas, as soon as formed, have a tendency to substitute themselves in the mind for individual objects, as the standards with which other objects are to be compared, and their resemblances or differences perceived. The general ideas thus abstracted from things should, in order to be suitable for the purposes of induction, be clear and appropriate; that is to say, the points of agreement between objects should be clearly perceived and accurately remembered; and, moreover, these points should be such as are of real importance, and are the marks of many other common properties. "If, for instance, we only compare animals according to their colour, and class those together which

are coloured alike, we form the general conceptions of a white animal, a black animal, &c., which are conceptions legitimately formed; and if an induction were to be attempted concerning the causes of the colours of animals, this comparison would be the proper and necessary preparation for such an induction, but would not help us towards a knowledge of the laws of any other of the properties of animals; while if, with Cuvier, we compare and class them according to the structure of the skeleton, the agreements and differences which are observable in these respects are not only of much greater importance in themselves, but are marks of agreements and differences in many other important particulars of the structure and mode of life of the animals."

ABSURDUM, REDUCTIO AD, is that species of argument which proves not the thing asserted, but the absurdity of everything which contradicts it. It is much used in geometry, in order to demonstrate the *CONVERSUS* of a proposition already proved. One of two things must be true: either the proposition asserted or something which contradicts it. If the opposing party deny the proposition, he must affirm that which is contradictory. Let his counter-proposition be taken for granted; then, if by the legitimate use of it some absurdity can be deduced, it is evident that his contradiction is wrong, and the original proposition right.

The *reductio ad absurdum* has been objected to as not equally conclusive with direct demonstration. For this there is no foundation; though it must be admitted that direct demonstrations are more pleasing and more elegant. But it is obvious that, if everything which contradicts a proposition be false, the proposition itself must be true.

ABU BEKR, father-in-law of Mohammed, was born A.D. 571. At the death of Mohammed, in 632, two powerful parties claimed the right of appointing his successor, one espousing the cause of Abu Bekr, and the other that of Ali, the son-in-law of the prophet. Abu Bekr was elected khalif on the 9th June, 632; but the contest divided the Mohammedan community into two sects, Sunnites and Shiites, which still exist—the former asserting the right of Abu Bekr and his successors, and the other that of Ali and his descendants. The reign of Abu Bekr was marked by constant warfare against the partisans of his rival and those of several rival prophets, but he was in the end victorious, and extended his kingdom over the whole of Arabia and Syria. He caused the precepts and ordinances of Mohammed, which had hitherto been partly oral and partly written, to be collected in the volume known as the Koran. He was remarkable for the simplicity of his habits, and the piety and liberality of his life, and is regarded by Mohammedans as being the mildest monarch who ever reigned. He died at Medina, 23rd August, 634, and appointed Omar as his successor in his will.

ABULFARAJ, properly *Mar Gregorius Abulfaraj*, an Oriental writer of much celebrity, was born A.D. 1226, at Malatia, a town near the sources of the Euphrates, in Armenia, where his father, Aaron, followed the profession of a physician. Though the offspring of a Jewish family, he embraced the Christian belief, to which he continued faithful till his death. Abulfaraj studied theology, philosophy, and medicine. He spent the greater part of his life in Syria. He was made a bishop at the age of twenty, and for some time held the see of Aleppo. In 1266 he was elected primate of all the Jacobite Christians in the East. He died at Maragha in Azerbaijan, A.D. 1286.

Abulfaraj was the author of a great number of Arabic and Syriac works; but the composition through which his name has become best known is an abridgment of general history, entitled "The History of the Dynasties." The work, which was written by the author both in Arabic and

Syriac, is divided into ten parts or dynasties, and contains a history of the world from the creation to his own time. The parts relating to the Mogul Tartars, the conquests of Genghiz Khan in Syria and Mesopotamia, and the Mohammedan history, are of very great value. The Arabic text of "The Dynasties," with a Latin translation, was published by Pococke, at Oxford, in 1663, 4to; the Syriac text, likewise with a Latin version, by Bruns and Kirseh, at Leipzig, in 1789, 4to.

ABULFEDA, a Moslem prince, famous as an author, was born in 1273, and was appointed by the Sultan Nasir ruler of the principality of Hamah in Syria, which he retained until his death in 1331. His books, which were written in Arabic, attest the extent and variety of his information. Among them are works on medicine, Mohammedan jurisprudence, mathematics, and philosophy. Those most commonly known are a treatise on geography, entitled "Takwim al Boldan," or "Disposition of the Countries," and an historical work called "Mokhtasar fi akhbâr-i-bashar," i.e. "A Compendium of the History of Mankind," which is very valuable, as being the most important Oriental source for the history of the Crusades which we possess. The part of the work which treats of the history of Mohammedanism was translated by Reiske, and edited with the Arabic text by Adler, at Copenhagen, in five vols. 4to, 1789-94; an edition and translation of the ante-Islamitic part was published by Fleischer, Leipzig, 1831, 1to.

ABURY. See **AVENURY.**

ABUSHIRE. See **BUSHIR.**

ABUTMENT, in building, that which receives the end of and gives support to anything having a tendency to spread. The piers or mounds on or against which an arch that is less than a semi-circle, or a series of such arches, rests, are abutments; while the supports of a semi-circular or semi-elliptical arch, or of an arch of any other figure, which springs at right angles to the horizon, are impostes. Nevertheless, the piers at the extremities of a bridge, of whatever form its arch or arches may be, are always termed abutments.

ABUTMENT, in machinery, is a fixed point from which resistance or reaction is obtained. Thus the breech of a gun forms an abutment for the expansive force of the powder; and in an ordinary steam-engine, each end of the cylinder acts alternately as an abutment for the steam, which, being unable to expand itself in the direction of the fixed obstacle, expends its whole force against the piston or movable obstacle. Even a rotatory steam-engine, with a continuous circular action, must have an abutment, although in the primitive rotatory engine of Hero of Alexandria, and in some modern machines on the same principle, the abutment is found in the resistance of the air. Springs, whether used, as in a watch, to impel machinery, or, as in the various kinds of spring-balance, to measure or control force, must in like manner have their abutments, as must all machines in which power is transmitted by means of screws. The name is applied in carpentry to a joint in which the end of one piece of timber is joined to the side of another, so that their fibres form an angle with each other.

ABUTTALS (from the French *abutter*, to limit or bound) are the buttings and boundings of lands to the east, west, north, and south, which show by what other lands, highways, hedges, rivers, &c., such lands are in those several directions bounded.

Formerly the boundaries and abutments of corporation and church lands, and of parishes, were preserved by an annual procession or perambulation, but the practice is rapidly falling into disuse.

ABYDOS was an ancient Greek town of Mysia, on the Asiatic shore of the Hellespont or Dardanelles. Sestos was

on the opposite European shore. It is said by Strabo to have been founded by the Milesians. Abydos was famed for its stout resistance when besieged by Philip II. of Macedon. It was burnt by Darius, the Persian, after his Scythian expedition; and somewhat later (B.C. 480) the people of Abydos witnessed the crossing of the immense army of Xerxes over the Hellespont by a bridge of boats. This bridge did not extend obliquely from Abydos to Sestos, which was a distance of more than 3 English miles, but directly across at a narrower part, where the distance is somewhat less than a mile. It commenced on the Asiatic side, a little higher up the stream than Abydos, and terminated on the opposite coast at the projecting point opposite to Abydos, and between Madytus and Sestos. A description of the bridge of Xerxes is given by Herodotus (vii. 36), who was on the spot probably much less than half a century after the event. No traces of the ancient town remain except the foundation walls of a building of considerable size.

Abydos has obtained a poetical celebrity from the story of Leander, who used to swim across the Hellespont to visit his mistress, Hero. Lord Byron's poem of the "Bride of Abydos" contains a passage relating to this story.

ABYDOS, an ancient city of Upper Egypt, the remains of which are found near two villages, El Kherbeh and Harabat, about 6 miles from the west bank of the Nile. It was famous for the palace of Memnon and the temple of Osiris. The chief building, which still remains, is nearly covered with sand, but the interior is in good preservation. This edifice is constructed of both limestone and sandstone. The numerous apartments it contains, and the style of decoration, show that Abydos was once a place of importance, and possibly a royal residence.

In the year 1818 Mr. W. Banks discovered on an interior wall of the temple of Osiris a kind of tablet or genealogy of the early kings of Egypt, which is now generally called the "Table of Abydos." This tablet consists of three compartments lying horizontally one above another, and each compartment has been divided into twenty-six rectangles, so that the whole has once contained seventy-eight rectangles. Each of these rectangles contains an elliptical ring, or cartouche as it is sometimes called, such as may be seen on the Egyptian monuments in the British Museum; and each cartouche contains those various figures which are now admitted to indicate the names or titles of sovereigns.

ABYSSINIA is an extensive country of north-east Africa lying between 8° 30' and 15° 40' N. lat., and 35° and 42° E. lon. It is called by the Arabs *Habesh*—"mixture" or "confusion"—on account of the mixed character of the population. The natives call it *Itiopia*, or *Manghesta Itiopia*, "the Kingdom of Ethiopia." It is bounded on the N.E. and E. by Adal, the tract of arid land bordering on the Red Sea, and the Somali country; on the S. and S.E. by the territory of the Gallas; and on the W. and N.W. by Nubia and Sennar. Its length from N. to S. is about 670 miles, and from E. to W. 540. The total area is 250,000 square miles. The country rises abruptly from the direction of the Red Sea, and consists of a series of extensive undulating table-lands, which gradually slope towards the W. in numerous terraces. These table-lands, ranging from 6000 to 10,000 feet above the sea, are divided by mountains of considerable elevation, mostly of volcanic origin, and intersected by numerous deep valleys and channels. The loftiest peaks are those of the Samenn range, 15,000 feet in height; they are covered with snow during the greater part of the year. The chief rivers of Abyssinia are the Abai—Bahr el Azrek, or Blue River—the Takazzie or Atbara, the Mareb, and the Hawash. The former, like most of the rivers of the country, forms a

branch of the Nile; it has its source at the foot of Mount Giesh, and after flowing through Lake Dembea, in which its current may be clearly traced, takes a large circular sweep, and eventually unites with the Bahr el Albiad, or White River, which is the true Nile. The Athara, which rises in the centre of Abyssinia, is also a tributary of the Nile; it has a length of 800 miles. The Mareb, in the north, after a course of 500 miles, becomes lost in the sand. The Hawash drains the eastern part of the country, and flowing in the direction of the Red Sea, loses itself among the lakes of Abhebad and Aussa. In the dry season many of the streams become very shallow, or are completely dried up; on the other hand, during the rainy period, which lasts from July to September, they are greatly swollen, and it is to the action of this immense body of water that the formation of the ravines, which constitute such a striking feature of the country, is to be attributed. These chasms or gorges vary in depth from 1000 to 4000 feet, and many of them being narrow, are at the bottom wrapped in impenetrable gloom. Abyssinia is also remarkable, geologically, for its extensive deposit of old lava streams. The principal lake is Dembea or Tzana, 60 miles long by about 30 broad; it contains several islands.

Climate, Soil, Animals, and Products.—The climate of Abyssinia, in consequence of its elevation, is temperate, the air in the higher regions being cool and bracing, and not too moist; but in the valleys great heat prevails, and it is there less healthy. The fertility of the soil, in the central and southern parts, is so great that in some places as many as three crops are raised annually. Agriculture is largely carried on, the result being seen in the production of barley, maize, wheat, beans, &c. The cultivation of rice, cotton, coffee, and the sugar-cane is also practised, although with regard to the latter the natives have not yet learned how to make sugar from it. A small grain, called teff (*Poa Abyssinica*), is extensively grown, and forms the bread in general use throughout the country. A black bread is also made from a kind of corn known as *tocussa*; it is eaten by the lower classes. Another article of food, much in use, is a plant called ensete, resembling the banana. The coffee plant grows wild on the western mountains; and among the fruit trees are the date, orange, lemon, pomegranate, and banana. Honey is an important produce, and the rearing of flocks and herds is extensively carried on. The horns of the famous Galla oxen are sometimes 4 feet long.

Wild animals are very numerous, and include the elephant, buffalo, leopard, lynx, wild cat, hyæna, a small species of wolf, a small species of fox on the table-land of Wotla, and the jackal. The two-horned rhinoceros, giraffe, zebra, quagga, wild ass, antelope, and two kinds of bear, the lion, panther, and monkey are occasionally met with. The larger quadrupeds are seen only in the wildernesses which lie along the northern and southern boundary of the country. Of smaller animals, there are the porcupine, rock rabbit, ground squirrel, ferret, polecat, and otter. Among birds are eagles, vultures, and Alpine ravens, and Rüppel met with three kinds of parrots. In Tigré there are herons and hornbills. The Egyptian goose and a species of duck, with several other kinds of water-fowl, frequent the swamps and lakes. Guinea-fowl, red-legged partridges, quails, snipes, larks, thrushes, swallows, and pigeons abound all through the country.

Hippopotami and crocodiles are abundant in the larger rivers, where many of the former are killed annually for their flesh and hides. Bees are so common that honey is very abundant, and is used instead of sugar. Locusts frequently lay waste the fields, especially on the table-land of Tigré. Serpents are not very numerous, but several poisonous species, amongst them the boa, are found.

The minerals of Abyssinia are iron-ore, rock-salt, sul-

phur, and some gold and silver. Coal is also said to exist, but is not worked.

Inhabitants.—It is estimated that the whole population of Abyssinia amounts to about 4,000,000. The bulk of them belong to the Caucasian race, and in features do not differ from the Bedouins of Arabia. They inhabit almost exclusively Amhára, Tigré, and Agow, and are generally well built and handsome, and of a dark olive colour. Another race is found mingled with them, called the Gallas. Their faces are round, the nose straight and short, the lips rather thick, but not resembling those of the negroes; the eyes very lively, small, and deeply set in the sockets; and their body is rather stout and large. They are fierce and turbulent, but form excellent soldiers; in fact, they constitute the greater part of the army. An ancient race of Jews, known as Falashas, inhabits the Samen district. There are no negroes, except those which have been imported as slaves from the countries bordering on the south and west.

Of the various languages of Abyssinia, the Geéz or Ethiopian is that used in the religious books and literature of the country. The court and mercantile community speak in the Amharic tongue; while the Agow, which is believed to have been the original dialect of the country, in its various dialects, forms the language of the great bulk of the inhabitants. The Gallas still retain their distinctive tongue.

The Abyssinians are a rude and barbarous people. Human life is but little respected, and the marriage tie is very easily dissolved. They are fond of feasting, and at their banquets it is a very common practice to serve up slices of raw meat, warm from the freshly killed animal.

Their religion is a debased form of Christianity, the spiritual head of which is the Abuna or father, who receives his appointment from the Coptic patriarch of Alexandria. They retain many Jewish observances, abstaining from the meats proscribed by the Mosaic law, practising circumcision, keeping both the Saturday and Sunday as Sabbaths, and regarding feasts as essential. There are numerous establishments for monks and nuns, who are looked upon with great reverence. Their veneration for the Virgin Mary is unbounded, and their saints are extremely numerous; but, as in the Greek Church, they have no images in their places of worship. In every part of Abyssinia there are many Mohammedans and Jews.

Industries and Commerce.—The trade and manufactures of Abyssinia are not of any great importance, owing to its isolated position. The chief articles made are cotton cloth, pottery, leather, and parchment, as well as implements of brass and iron. The exports consist of gold, ivory, cattle, honey, wax, coffee, and butter. The slave trade is also carried on. The imports are gunpowder, coloured cloths, silk, lead, and other miscellaneous articles.

Three political divisions at present exist in Abyssinia: Tigré in the north, Amhára in the centre, and Shoa in the south. The chief places of interest are Adowa, Ankobar, Axum, Gondar, Magdala, and Massowah.

History and Government.—The name of Abyssinia became known in Europe from the Portuguese missionaries who penetrated there, and who often wrote the names of the country and the people respectively in the Latinized forms of *Abassia* and *Abassinos*, from which our common term *Abyssinia* is derived.

The Abyssinians (whose early history is merely traditional) were converted to Christianity in the time of the Emperor Constantine, by some missionaries sent from Alexandria. The power of the emperors of Abyssinia seems then to have been well established. In the sixth century they were able to send an army to Arabia and conquer a part of Yemen: this was the period of the greatest political power of Abyssinia. Seventy years afterwards the Abyssinians were deprived of Yemen by the Arabs,

who soon attacked Abyssinia itself. After this time great disorder crept into the internal affairs of the empire, for in the year 925 a Jewess, called Sague, overthrew the reigning dynasty and destroyed Axum, the ancient capital. [See AXUM.] For more than 300 years the country appears to have remained in a distracted state, until the Emperor Iqon Amlaq recovered the whole kingdom, about 1255; and during the following three centuries the country improved. Towards the end of the fifteenth century Pedro Covilhão, an agent of the court of Lisbon, visited Abyssinia, and this circumstance saved the empire from destruction, for the embassy aided the emperor in repelling a neighbouring foe: the empire was saved, but the southern provinces were lost. By these events the seat of the emperor was transferred from Shoa to Gondar, and a gradual decay of the imperial power took place, until the country was in reality ruled by the most powerful chiefs, who placed various members of the royal family on the throne merely as "puppet kings." As a natural consequence Abyssinia was kept in an almost perpetual state of revolution. The late emperor Theodore succeeded to power in 1855, and speedily conquered nearly the whole country. His attention was soon directed to obtaining recognition and friendly intercourse from Great Britain. A treaty had been made between the two countries in 1819, and was ratified in 1852. In this treaty it was stipulated that each state should receive ambassadors from the other. The emperor, desirous to strengthen his authority, resolved to assert the rights thus assured to him; but unfortunately the officer who represented British interests in those regions was killed in 1860, and Mr. Cameron was sent to succeed him. On his arrival in 1862 the emperor told him that he desired to carry out the treaty. Towards the end of that year he wrote an autograph letter to the queen, requesting permission to send an embassy to England. This letter arrived in England in February, 1863, and for some reason or another was left unanswered. At this the emperor's wrath appears to have been roused, and he vowed vengeance on the islanders and all connected with them. Some missionaries from Scotland, England, and Germany had settled in the country, with the permission of Theodore, and under the protection of the English consul; and the king sent a body of troops to the missionary station, seized the missionaries and Mr. Cameron himself, put them in chains, and cast them into prison. This was done in November, 1864, and from that time to 1867 they were kept more or less closely in confinement, and suffered every indignity. A reply to the king's letter was forwarded in 1864, and intrusted to Mr. Rassam, a native of Mosul, who had before been employed on diplomatic service at Aden; but the choice was unfortunate, as the emperor looked upon him as a Turk—he had always considered the Turks his bitterest enemies—and he was not even received until January, 1866. Then another unfortunate circumstance occurred, for the emperor having made Mr. Rassam a large present, and not receiving anything adequate in return, he ordered him to be cast into prison. Two autograph letters from Her Majesty and some handsome presents were afterwards sent by the British government, and, as a last resource, some English workmen were allowed to be engaged by the emperor; but all proved of no avail. Accordingly, in April, 1867, Lord Stanley sent him an ultimatum to deliver up the prisoners in three months, or they would be rescued by force. He took no notice of this communication, and in the following October an army of 10,000 men were despatched from Bombay, under the command of Sir Robert Napier. The force landed at Zulla, on the Red Sea, and in spite of many obstacles reached Magdala, where the prisoners were confined, early in the following April. On the 10th of that month the Abyssinians gave battle to the advanced British troops, but were defeated so thoroughly

that all the captives were delivered up the next day. The emperor himself, however, refused to surrender; and on the 14th Magdala was stormed with little difficulty, Theodore being found dead at the gate of the city, having shot himself to avoid capture. His wife and son were taken to the British camp, but the former died in a few days, and the son, who was taken to England to be educated, died there in 1879. The object of the expedition having been accomplished, the British troops immediately left the country, which at once became a prey to internal dissension. Kassa, the prince of Tigre, ultimately conquered Gobasie, and assumed the new name of John, with the title of the King of the Kings of Ethiopia. Subsequently he subdued Ras Warena, who ruled Amhara, defeated with terrible slaughter an invading Egyptian force, and in 1877 gained a decisive victory over Meuchik, king of Shoa. During the war in the Soudan in 1884, Admiral Sir William Hewitt was despatched on a mission to King John, with a view of keeping him on friendly terms with Egypt, and of securing, if possible, the aid of the Abyssinians in effecting the relief of the Egyptian garrisons. After some difficulty Sir William succeeded in making his way to the king and concluding a treaty with him, but though the Abyssinians refrained from hostilities against Egypt they did nothing towards the relief of the beleaguered Egyptians. ("The Cradle of the Nile," by M. de Cosson, London, 1878; "A Visit to Abyssinia," by W. Winstanley, London, 1881.)

ACA'CIA is the name of a plant of the LEGUMINOSÆ, or Pea tribe. It is mentioned by Dioscorides as a useful astringent thorn, yielding a white transparent gum. The account given by this Greek author, meagre as it is, accords so well with the gum-arabic trees of modern Egypt, that we can scarcely doubt their identity.

The Acacia is a very extensive genus of trees or shrubby plants, inhabiting the tropical parts of both the Old and New World, and only in a few instances extending into temperate latitudes.

Some of the species produce catechu and gum-arabic; the bark of others yields a large quantity of tannin. The species from which this substance is procured are chiefly *Acacia decurrens* and *mollissima*. As objects of ornament they are usually of striking beauty; and it may be doubted whether, in the whole vegetable kingdom, equally brilliant colouring and elegant foliage, combined with a most graceful aspect, are united in the same individuals.

Botanists are acquainted with about 420 species. They are extremely variable in the structure of their leaves and flowers. Some of them have true leaves that are twice or thrice pinnate, with a multitude of minute, shining, or at least even leaflets; others have, in a perfect state, no leaves properly so called, but in their stead the leaf-stalks enlarge, and assume the appearance, and also the functions, of true leaves. Species of the latter description are known by their spurious leaves being expanded vertically, instead of horizontally, as in leaves of the ordinary construction.

Acacia Catechu is a tree with a tolerably high and stout stem, found in mountainous places in the East Indies, especially in Bengal and Coromandel. Its pods are from 2 to 3 inches long, quite flat, and of a narrow oval figure. Its heart-wood yields, by decoction, one of the sorts of catechu, a powerfully astringent substance used by dyers and tanners. *Acacia arabica* is an inhabitant of the East Indies, Arabia, and Abyssinia, where it forms a tree 13 or 14 feet high, of inelegant appearance; easily recognized by its long curved pods, which are divided into a number of round compressed joints, by means of contractions between the seeds. This is one of the plants that yield the useful substance called gum-arabic, which is procured by wounding the bark; after which the sap runs out, and hardens in transparent lumps, of various figures,

very similar to the concretions found upon the bark of the cherry-tree in this country. Gum-senegal is the produce of a distinct species, called *Acacia Senegal*, found in Arabia and the interior of Africa. From this tree are procured the pods called *bablack* in the Continental drug-shops; by others, however, they are referred rather to *Acacia cineraria* and some other species. *Acacia discolor* is a middle-sized tree found in the southern parts of Australia and in Tasmania, where it, in common with many others of the same name, is called *Wattle*. *Acacia julibrissin* is a native of Persia and of the Levant. Its specific name is Latinized from two Persian words—*gul*, a rose; and *chruschim*, silk—by which it is known in the countries where it grows wild. There it becomes a small tree, remarkable for its light airy foliage, and for the great beauty of the clusters of lilac flowers, the long and slender stamens of which stream in the wind and glitter in the sun like a number of silken tassels artificially fastened to the boughs. This species is now commonly cultivated in the warmer parts of Europe. In England it is seen trained against walls, where it succeeds indifferently well, flowering only occasionally so far north as the latitude of London. Its great enemy in this climate seems to be, not our winters, but the want of an intensely hot summer to prevent exuberant growth, and to ripen the shoots so perfectly as to enable them to resist frost. *Acacia decipiens* is remarkable for the blunders to which it has given rise. When botany was only a science of names, its flowerless branches were taken for the leaves of a kind of fern; and at a later period, when botanical geography was as yet unlearned, it was believed to be a native of the north-west coast of North America—an opinion as probable as that would now be considered which referred the origin of a race of blackmoors to Great Britain. It is an inhabitant of the south-west coast of Australia, where it forms a bush of singular aspect. In this country it is cultivated in the greenhouse, and it flowers in March, April, and May. *Acacia Sophera* is a native of the south side of Australia and Tasmania. In this country it is a very ornamental greenhouse plant, which, if planted in the open border, will grow as high as 8 feet. It flowers during all the early months of the year, producing its numerous clusters of sweet yellow blossoms in great profusion. Few plants are more worthy of a station in a good conservatory. *Acacia vera* is the thittin wood of Scripture. The species of this genus are increased artificially in two different ways. Most of them may be multiplied by cuttings struck in silver sand, placed under a bell-glass, and kept in a warm place, to which no direct solar light has access. Such of them, however, as do not increase with sufficient certainty by this method, *Acacia julibrissin*, for instance, have the power of producing shoots from pieces of their root placed in earth in a hot-bed; and by these the nurserymen generally propagate them. Their seeds are also very often received, and from these they can, of course, be multiplied in all cases. The Locust-tree of North America is often called *Acacia*, but it belongs to a different group of the Leguminosæ; its scientific name is *Robinia pseud-acacia*.

ACADEMY, from *Academia* (*Ἀκαδημία*), a garden in the Ceramicus, a suburb of Athens, so called, as it is said, from its original possessor, Académus, who kept there a school for gymnastic exercises. The garden afterwards became the property of Cimon, son of Miltiades, who adorned it with statues, fountains, and groves, and by his will left it to the public. It was one of the favourite haunts of Socrates and his disciples; but the Academy owes its celebrity as a seat of philosophy to Plato, who established his school here, over which he presided for nearly half a century. Hence the followers of Plato were called the Academici, and the philosophy of the Academy meant the philosophy of Plato. After the revival of letters

in Italy the term Academy came again into use, but with a signification somewhat different. An association of individuals, formed for the cultivation of language and science, and usually endowed by the state in which it was established, was called by the Latin term *Académia*. In modern times the name has been applied to associations formed for the cultivation of literature, art, and science. Of these the most famous is the French Academy, which consists of forty members, and was founded in 1635 for the study and improvement of the French language. It thus included within its ranks most of the foremost authors of France, and has exercised a great influence over the language and literature of that country. In England we have the Royal Academy, which was founded in 1768 for the encouragement of designing, painting, and sculpture; the Royal Academy of Music, founded in 1822; and several learned societies, such as the Royal Society and the British Association for the Advancement of Science, which differ from academies only in name. Academy is a name also used to denote a school or college, as the Royal Military Academy at Woolwich; but its application to schools of all kinds must certainly be regarded as an abuse of the term.

ACADEMY, ROYAL (of Arts). See ROYAL ACADEMY OF ARTS.

ACADEMY, ROYAL (of Music). See ROYAL ACADEMY OF MUSIC.

ACA'DIA, by the French called *Acadia*, is the genuine Indian name of NOVA SCOTIA.

ACALE'PHÆ, or Sea-nettles (*ἀκανθήφα*, a nettle), is Cuvier's class of certain marine animals, so called from their power of stinging by means of microscopic threads contained in cells of the integument. These animals are now contained in the class HYDROZOA and ACTINOZOA, of the subkingdom CILLIATERATA.

ACANTHA'CEÆ, a group of plants forming one of the natural orders in the monopetalous division of dicotyledonous plants. Its name is derived from the genus *Acanthus*, which has been considered characteristic of the whole order. The plants of which it is composed are either altogether of an herbaceous nature, or shrubby in a slight degree only; they are common in every tropical country, where they may be considered to occupy the place of the mints, dead-nettles, thymes, and sages of Europe; a few only are found beyond the limits of the tropics. Many of the species are mere weeds; others bear handsome flowers with gaudy colours.

The roots of the Acanthaceæ are either annual or perennial. The stems are usually four-cornered when young, but afterwards become nearly round; the inner part of the stem is occupied by a large proportion of loose cellular tissue, which is inclosed in a thin layer of imperfectly-formed wood; and at each joint there is a slight tumour with an articulation, by which they are readily known from both Scrophularinæ and Verbenacæ. Their flowers are often inclosed within large leafy imbricated bracts. The calyx is usually composed of either four or five parts, which overlap each other, and occasionally grow together at the base. The corolla is monopetalous and irregular. The stamens are either two or four, but in the latter case are of unequal lengths. The pistil is superior. The seed-vessel contains two cells, which burst when ripe, often with elasticity, and expose a few roundish seeds hanging to the cells by cup-shaped or hooked processes.

The stems of all the species emit roots very readily from their tumid joints; on which account gardeners universally increase them by cuttings of the full-grown branches. They are always easy to cultivate, provided they are not kept in too cold or too dry a situation. The annual kinds freely produce seeds.

ACANTHIAS, or "Spiny Dog-fish," a genus of the family Spinacidae, which is characterized among CROX-

DROPTERYGII by having two dorsal but no anal fin nor nictitating membrane, a long groove on each side of the mouth, narrow gill-openings, and "blow-holes." The *Acanthias* has a spine in each dorsal fin, and small teeth of the same size in each jaw. Dr. Günther points out that their distribution is remarkable, as they are found in both northern and southern temperate zones, but not in the tropics. *Acanthias vulgaris* is found off the British coasts, sometimes in countless numbers. Mr. Couch says that he has known 20,000 taken at one cast of the sear. At one time these dog-fishes committed such ravages on the fisheries of Denmark that eight vessels were fitted out expressly for their capture, but though many thousands were taken there was no sensible diminution of their numbers.

ACANTHOCEPHALA is the name given to one of those orders of worm-like animals that live parasitically in the alimentary canal of some mammals, birds, and fishes. The name is derived from *ἀκανθα*, thorn, and *κεφαλή*, head, and thus means the "Thorn-heads." It is rather unfortunate that the name suggests the possession of a head, for there are neither eyes, mouth, nor organs of smell or hearing. The part that looks as if it would be a head if it could, is armed with hooks curved backward (see Plate NEMATHELMINTHIA, fig. 2, b, c). With these hooks the worm attaches itself to the alimentary canal of such animals as it inhabits, and there it passes a life of ease, without the necessity of seeking for its food. Full-fed as it is, there is no risk of dyspepsia, for it has no stomach, and does not need one, the juices already digested by the unwilling host passing in through the skin all over the body. Neither is it troubled much with nerves, for there is only a single nerve-knot at the base of what may be called the proboscis rather than head, and this gives off simple nerve-fibres to different parts of the body. The skin is thin and soft, and marked with transverse wrinkles. Beneath the skin are two sets of muscular fibres, the outer one passing round the body in rings, the inner set running along the whole length. Although there are no blood-vessels, there is what Huxley supposes to correspond to "some modification of the water-vascular system," a network of minute vessels containing a clear fluid, but in this case with no openings through the skin. About 100 species have been described in the two genera *Echinorhynchus* and *Coleoeps*. The *Acanthocephala* belong to the NEMATHELMINTHIA, a class of VERMES.

ACANTHOPHIS (from *ἀκανθα*, a thorn, and *ὄφις*, a snake), a genus of venomous snakes allied to the cobra, and termed *Acanthophis* from the circumstance of the tail terminating in a sort of horny little spine. The plates beneath the tail form a single series, excepting towards the very tip. The head is obtuse, and rather prominent over the eyes; and the scales of the back are rhomboidal. The species are of small size, and inhabit dry places, feeding upon small animals, as mice, frogs, &c. They secrete themselves in holes, or beneath the roots of trees, and are viviparous. Their bite is very dangerous—perhaps indeed always fatal. The death-adder (*Acanthophis antarticus*) of Australia is a hideous reptile, thick in proportion to its length. A dog bitten by one died in less than an hour; and the head of one which had been separated for more than ten minutes from the body seized upon the foot of a dog, which soon died in dreadful convulsions—a proof of the vitality of the reptile and the virulence of its poison. See SERPENTS.

ACANTHOPTERYGII (*ἀκανθα*, a thorn; *πτερυξ*, a wing), in Fishes, is an order of TELEOSTEI, comprising those in which part of the rays of the dorsal, anal, and ventral fins are spinous, not jointed; the lower pharyngeal bones separate; and the air-bladder, if present, without a pneumatic duct in the adult. If the lower

pharyngeal bones are united, they form, according to Dr. Günther, a separate order, the *Acanthopterygii Pharyngognathi*.

Dr. Günther divides the *Acanthopterygii* proper into nineteen divisions. The Porch division contains the freshwater and sea perches, chetodonts (fig. 1), the sea-breems (fig. 2), the red mullets (fig. 3), &c. The second division is the Beryx family; the third, the Kurtus family; the fourth, the Polynemus family; then follow the maigres (fig. 4), the hair-tails (fig. 5), the sword-fishes (fig. 6). The eighth division is large and important, containing the mackerels, the gurnards (fig. 10), the weevers (fig. 9), the flying gurnards (fig. 11), the anglers (fig. 7), the loach-fishes (fig. 12), the dragon-fishes (fig. 8). We have next the division containing the gobies (fig. 13), the blenny division, the mullets (fig. 14), the trumpet-fishes (fig. 15), the stickle-backs and flute-mouths (fig. 16), the suckers (fig. 17), the snake-heads (fig. 18). The sixteenth division contains the Anabas (fig. 19), the paradise-fish, the gourami, Betta. The seventeenth division contains only one species, *Lophotes cepedianus*. The Ribbon-fishes form the eighteenth, and the Notacanthins the nineteenth division. The Wrasse family is the only one of much importance amongst the *Acanthopterygii Pharyngognathi*. See articles under the above headings for further details.

ACANTHURUS (from *ἀκανθα*, a thorn, and *ὄψις*, a tail), a genus of acanthopterygious fishes, often termed "doctors" or "surgeons" by English sailors and colonists, because they are armed on each side of the tail with a sharp movable spine like a lancet, which they use with great effect, inflicting severe wounds on the hands of those who touch them incautiously. Hence the generic title, which means thorn-tail. These dangerous weapons, placed where they can be used with the most advantage (the greatest strength of the fish lying in its tail), render these otherwise harmless fishes capable of defending themselves against the assaults of larger species, to which they are exposed. When at rest, these spines fit into grooves on each side of the tail. The body is very deep, much compressed, and covered with minute ctenoid scales; the jaws are furnished with a single series of incisor-teeth, which are treacherous and denticulated, like a very fine comb; the ventral fins have one spine, and the dorsal fin is single. Many are remarkable for the beauty and variety of their colours. They are confined to the tropical seas, and are unknown in temperate latitudes. They belong to the MACKEREL division of the ACANTHOPTERYGII.

ACANTHUS. Under this classical name have been described, by ancient authors, at least three totally different plants. First, a prickly tree with smooth evergreen leaves, and small round saffron-coloured berries, frequently alluded to by Virgil; this is conjectured to have been the holly. Secondly, a prickly Egyptian tree, described by Theophrastus as having pods like those of a bean; it is probable that this was the *Acacia arabica*. [See ACACIA.] Thirdly, an herb mentioned by Dioscorides, with broad prickly leaves, which perish at the approach of winter, and again sprout forth with the return of spring. It is said that the idea of the Corinthian capital of Greek columns was taken from some of the leaves of this acanthus. To this latter plant the name is now applied. The word, in all cases, alludes to the prickly nature of the leaves or stems.

In modern botany, *Acanthus* is a genus of herbaceous plants found in the south of Europe, Asia Minor, and India, belonging to the natural order ACANTHACEÆ.

ACANTHUS, in architecture, the sculptured leaf which is the distinguishing characteristic of the capital of the Corinthian column. The same leaf, however, is used occasionally in other foliated capitals, as well as for the

enrichment of modillions, of mouldings, and of vases. It has been generally supposed that the leaf imitated was that of the *Acanthus mollis*, or Brankursine, but this plant is not found in Greece or the Greek islands, and it was there-



Roman.

Greek

fore probably the *Acanthus spinosus*, which grows there, and is still called *kantha*. This ornament, in the Roman models, is fuller and broader than it is in the Greek.

A. CAPELLA, or Alla Capella, in the church style, music written in strict ecclesiastical style, and in duple time, two or four minims to a bar. See **ALLA BREVE**.

ACAPULCO, a city in Mexico, about 183 miles S.S.W. from the capital. It stands in the recess of a bay, close to a chain of granite mountains, and is the best Mexican port on the coast of the Pacific Ocean. It is defended by the castle of San Diego. The bay has two entrances, formed by the island Roqueta or Grifo: that on the west is about 280 yards wide; the great entrance from the south is about a mile and a half wide, with a depth of water from 150 to 210 feet. The port is capable of containing 500 ships, and is deep enough to allow vessels to anchor close to the rocks. Lying within the torrid zone, and surrounded by mountains, the town is intensely hot, and the inhabitants, particularly new comers, are liable to dangerous fevers. The city of Mexico, in the interior, communicates with the Pacific by the town of Acapulco, which once had a considerable trade, particularly with Manila, the capital of Manilla or Luzon, one of the Philippine Islands. Under the Spanish dominion a vessel of the largest size used annually to leave Acapulco for Manila, about February or March, loaded with commodities and specie. The vessel returned to Acapulco in August, carrying back muslins, printed calicoes, coarse cotton shirts, porcelain, Chinese jewellery, &c. Its arrival was the signal for a great concourse of merchants to Acapulco, who swelled the population for the time to about 9000. After the abolition of the monopoly enjoyed by Acapulco, while under the dominion of Spain, its India and China trade was secured by towns more favourably situated; but after the discovery of the gold mines in California it again became the most important port in Mexico, and is regularly touched at by the Pacific mail steamers. The town has suffered much from earthquakes. The present number of inhabitants, who are principally people of colour, and consist of pearl-fishers, sailors, and husbandmen, is about 5000. Its exports are cochineal, indigo, cocoa, and skins; the imports include cottons, silks, spices, and hardware.

ACARIDEA is an order of ARACHNIDA, including the Mites and Ticks. The head, thorax, and abdomen are all united into one mass, and the abdomen is not divided into distinct rings or segments. There are four pairs of legs in the adults, and three in the young. Respiration is effected simply by the skin, or by means of *tracheæ* (tubes passing through the body from holes in the skin of the abdomen). The mouth is generally fitted for sucking, but sometimes for biting. The Acaridea are hatched from eggs, and some afterwards undergo a moult.

Many of them are parasitic; some infest the skin, often burrowing under the surface, while others spend part of their existence on one animal, and then go to another. *Sarcoptes scabiei* causes the skin-disease known as the "itch;" it has no eyes, the two front pairs of legs have suckers. The itch is contagious, and may be taken even from animals. The most effectual remedy, besides the necessary cleansing of skin and clothes, is the application of balsam of Peru. *Demodex folliculorum* is a harmless little parasite inhabiting the sebaceous follicles of the hair of man, especially those in the nostrils; this parasite is probably universal. It is very minute, and has neither mouth nor feet, although it undergoes two or three moults or changes of skin before arriving at the adult form. *Demodex* is also found in the dog, causing the mange. The well-known cheese-mite is *Acarus domesticus*, which has a mouth provided with mandibles. *Acarus destructor* is the plague of the naturalist, as it lives on his zoological specimens. *Acarus eruditus* lives in books. *Dermanyssus avium* infests birds, sometimes even killing them. The under side of dung-beetles is generally found lively with *Gamasus coleopterorum*. A species of *Argas* attacks travellers in Persia, and causes the most acute pain; another is known in Columbia. *Acarus reflexus* is found on pigeons.

The Ticks belong to the genus *Ixodes*; the mouth has a beak, enabling them to pierce the skin and attach themselves securely. *Ixodes ricinus* is the common tick, found on the sheep, dog, and even on man. The beautiful little "red spider," which weaves a silky web on the leaves of plants, is the *Tetranychus telarius*. A well-known pest in the country is the "harvest bug" (*Leptus autumnalis*). Trombidium is parasitic only in its young state. Phytopytus has only two pairs of legs. It causes great injury to plants, sometimes eating into the interior of the growing buds, at other times giving rise to gall-like excrescences. The "witch knot" of the birch is the result of the attacks of Phytopytus. The "water mites" (*Hydrachna*) are parasitic while young, and are found on various water insects. The shell-fish *Mytilus*, *Unio*, and *Anodonta* have been found suffering from the presence of *Atax* in their gills, and the skin of the foot and mantle.

ACARNANIA, an ancient division of Northern Greece, which was bounded on the north by the Ambracian Gulf, now the Gulf of Arta, on the north-east by the small territory of Amphiloehia, and on the west and south-west by that part of the Mediterranean to which the Greek and Roman writers gave the name of the Ionian Sea. The eastern boundary is not easy to determine. It extended in the time of Thucydides, who wrote during the Peloponnesian War (which commenced B.C. 431), east of the river Achelous, and encroached upon the territory of the Ætolians. Under the Romans, or somewhat earlier, the Achelous was made the dividing line. Acarnania afterwards became part of the Roman province of Epirus, and Ætolia was attached to the province of Achaia. Acarnania, with Ætolia, now forms a nome or department of the modern kingdom of Greece. It has sometimes been called Carlelia, or Carnia, which appears to be a corruption of the ancient name. Its chief town was Stratos, and afterwards Leucas.

The longest straight line that can be drawn in Acarnania—from Actium to the mouth of the Achelous—is about 50 miles. The length of sea-coast from Actium, near the entrance of the Ambracian Gulf, to the mouth of the Achelous, is reckoned by Strabo to be about 570 stadia, or 57 miles. Modern charts give a length of from 70 to 80 miles, measuring in a rough way, along the irregular outline of the coast. There are several good ports, which, added to the general fertility of the country, might have made the people wealthy; but the primitive inhabitants

never attained any reputation either in commerce or the arts. Their best ports were occupied by Corinthian colonies; and the inhabitants, engaged in continual wars with their neighbours, are characterized by Thucydides as living in a state of piracy and robbery, at a time when Athens (which was not 150 miles from the mouth of the Aechelous) had seen the dramas of Æschylus and Sophocles, and was adorned with the great works of Phidias.

In its present condition Acarnania is very thinly inhabited. It contains a considerable portion of good soil and well-wooded hills—a rare feature in modern Greece. There are several lakes.

Bordering on Acarnania, on the north-east, was the small territory of Amphiloehia, which, with its capital Argos, was sometimes reckoned a part of Acarnania, owing to the political connection between the two people.

A'CARUS. See ACARIDEA.

ACAULESCENT, in botany, is applied to plants in which the stem is so little developed as not to be apparent. This stunted condition probably arose at first from growth in poor soil, or from some other accidental circumstance, and in time became permanent in the plant. *Carduus acutis*, the ground thistle, which grows on chalky land, is often found in better soil growing to the height of a foot.

ACCELERATED MOTION is such a movement of a point or body that the spaces which it describes in successive equal portions of time are successively greater or less, or the velocity is continually increasing or diminishing; and the power which produces such movement is called an accelerating power. More exactly, acceleration is the rate of change of velocity, whether that change take place in the direction of motion or not.

It is a known fact that, when a body falls towards the ground, the motion is uniformly accelerated; that is, whatever be the velocity which it has acquired at the end of the first second of time in its descent, it will have acquired twice as much at the end of two seconds, three times as much at the end of three seconds, and so on; the observed deviations from this law being attributed to the resistance of the air. The law of descent is the same, whatever be the substance of which a falling body is composed, as is manifest from a piece of lead and a feather descending from the top to the bottom of an exhausted receiver in equal times. Near the earth's surface, in the latitude of London, a body descending from a state of rest falls $16\frac{1}{2}$ feet in the first second of time; and, since this space is described with velocities which begin with zero and form an arithmetical progression, consisting of an infinite number of terms differing from one another by unity (the power also, which caused the motion being conceived to act constantly and with uniform intensity), it may easily be shown that the velocity acquired at the end of the first second is exactly twice that velocity with which an equal space might be described in an equal time (one second) by uniform motion: hence, $16\frac{1}{2}$ feet representing that mean velocity, the velocity acquired at the end of one second is $32\frac{1}{2}$ feet. This number is taken to express the measure of the accelerative force of gravity in the latitude of London, and it is usually represented by g .

It is found that the velocity acquired by a body, in descending from rest, at the end of two seconds is $64\frac{1}{2}$ feet, at the end of three seconds is $96\frac{1}{2}$ feet, and so on; that is, the acquired velocities are proportional to the times of motion. It is also found by experiment, and it may be easily shown to be the result of an accelerative force continually acting uniformly, that the space which a body, descending from rest, describes in two seconds is $64\frac{1}{2}$ feet, in three seconds is $144\frac{1}{2}$ feet, and so on; that is, the spaces described are proportional to the squares of the times: and, t representing the number of seconds, the spaces are represented by $\frac{1}{2}gt^2$.

ACCENT, in music. A great part of the pleasure given by modern music is due to the fact of its being in *time*; by which we mean that accent or emphasis recurs at certain equal intervals, producing a sense of rhythm identical with the rhythm of verse in its effect upon the mind. Indeed, the music of the drum, which those who have heard a "tattoo" will admit to be not without interest, is altogether of this character; and dance music is too often almost entirely dependent upon it for effect.

Yet in the middle ages, after the delicate rhythms of Greek poetry and music had died out, absolutely *timeless* music was performed for centuries, and indeed much of it has survived to our own day in the services of the Roman Church, especially on the Continent. The nearest approach to this style of non-accented music readily to be met with amongst ourselves is in the reciting note which begins a church chant, the number of syllables sung to which differs with every verse; but the repaider of the chant being in *time* satisfies the modern longing for accent. But dance music, and the songs to the rude rhythms of the Tronbadours, were accented even in those days of musical darkness.

The most agreeable rhythms to the ear are those of groups of two, of three, or of four notes; and to render these groups clearly perceptible the first note of each receives a slight accent, whilst to make them visible to the eye the groups are separated by BAUS drawn across the music-lines immediately in front of the accented note. Common time, as it is called, containing a group of four notes, may be considered as two groups of two; and consequently the second group of the two receives a weaker accent on its first note to make clear its subordinate position in the bar. In the same way groups of three are combined, and similarly the first notes of second or third groups are less accented than that of the first group in the bar.

For the sake of clearness we have spoken of groups of two or of three single notes, but in actual practice each principal note is frequently subdivided.

The very marked difference of effect produced by a difference of accent will be noticed in the above examples, which are all upon the same notes.

Beautiful effects are produced by an accent introduced at an unexpected point, indicated by \wedge or sf placed over the note to be accented; or by a note struck at an unaccented part of the bar (as, for instance, the last note of a group of three), and held on into the following accent. The latter is called **SYNCOPE**. By combining these two the composer can readily completely neutralize the natural accent—a favourite device of Beethoven (as in the Third Symphony, &c.) and of Schumann (Finale of Pianoforte Concerto, &c.); a duple effect may thus be forced upon a triple time, and *vice versa*. In all such movements the composer is careful to return clearly to the natural accent as soon as the surprise he has sought to cause has been obtained in the mind of the hearer. For further details see **TIME**.

Accent of Phrasing.—Besides the time accent, dividing the movement into groups of a bar's length, the phrases of a composition must be clearly grouped and contrasted by the melodic or *rhythmical* accent, since all well-ordered

compositions fall into rhythms or groups of bars, just as bars are made up of single notes. See FORM AND RHYTHM.

Accentus Ecclesiasticus, the system of reciting in the Catholic Church, whereby the chanter inflects the monotone at each mark of punctuation in the Scriptures. For instance, in chanting one part of the service, at a comma the voice sinks a third and rises again; at a full stop, falls a fifth, &c. This accent varies in the Gospel from that used for the Epistle; both of these vary from that for the ordinary Lessons, &c. Roman accents are unwritten; but the accents used in Hebrew chanting are far more numerous and melodious, as are also those used in the Greek Church, and are written over the Scripture in signs or NEUMES.

AC'CENT. In modern languages there is in nearly every word at least one syllable which must be distinguished from the rest by a more impressive utterance, as in the examples, *respect*, *respectful*, *respectable*. If the word is a long one it requires a second accent, as *respectability*, *minu'factory*, *immortalize*. On the other hand, when short words come together, one or two are often devoid of accent, as in the phrase *on the top of a hill*. When it is stated that the accented syllable is pronounced more impressively than the rest, it is not meant that all accented syllables are to be equally impressive. In the examples given above, the first accent in *minu'factory* seems to be weaker than that on the third syllable; so the last accent in *immortalize*, and that attached to the preposition *on* among the six monosyllables *on the top of a hill*, are comparatively very faint.

The accents of words are changed from time to time, and are even variable at the same time. Thus the verb which we call *triumph* was with Milton generally *triumph*; the noun and the verb being commonly distinguished by him in the same way as *produce* (the noun) and *produce* (the verb) are at the present day. Even in our own time *advertisement* has become *advertiement*. In these changes the usual tendency in our language is, and always has been, to throw the accent farther back from the end of the word. Such a tendency is, perhaps, inherent in all languages, and seems to arise solely from an endeavour to save labour by rapidity of utterance.

The symbols employed to denote accents are three, the acute ('), the grave (`), and the circumflex (^).

Emphasis differs from *accent*. See EMPHASIS.

ACCEP'TANCE, ACCEP'TOR. See BILL OF EXCHANGE.

AC'CESSORY or AC'CESSARY (Latin, *accessorius*), is one who is guilty of a felony, not as chief actor, but as a participator, without being present at the time of the committing of the offence, as by command, advice, instigation, or by concealment, and the like. A man may be accessory either before the fact or after it.

An accessory *before the fact* is defined by Lord Hale to be one who, "being absent at the time of the crime committed, doth yet procure, counsel, or command another to commit a crime." The mere concealment of a felony intended to be committed, without actual instigation, will not make a man an accessory; that is only a misprision of felony. If a man commands another to commit an unlawful act he is accessory to all the consequences that may ensue upon it, except such as could not in any reasonable probability be anticipated; for instance, if he commands another violently to beat a third person, and he beats him so that he dies, the person who gives the command is guilty as accessory to the murder consequent upon the act, notwithstanding it may not have been his intention that a murder should be committed. If the directions have been *substantially* pursued, although the crime may not have been committed precisely in the manner in which it was commanded to be done, as where a murder is effected by

stabbing instead of poisoning, he who gives the directions is an accessory before the fact.

An accessory *after the fact* is one who, knowing that a man has committed a felony, receives, relieves, or assists him. In general, any assistance given to a felon to hinder his being apprehended, tried, or suffering punishment, will constitute the assister an accessory after the fact. Although any act done to enable the criminal to escape punishment will make a man guilty as accessory after the fact, a mere omission to apprehend him, without giving positive assistance, will not have that effect. Also, if the crime be not completed at the time of the relief or assistance afforded, the reliever or assister is not judged an accessory to it, as where a mortal wound has been given, but the murder is not then completed by the death of the party; yet if the crime is once complete, not even the nearest ties of blood can be pleaded in justification of concealment or relief, except in the case of a wife, who is legally presumed to be so much under the coercion of her husband that she ought not to be considered as accessory to his crime by receiving him after it has been committed.

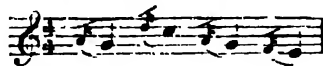
By the statute of 24 and 25 Vict. c. 94, the punishment of accessories before the fact is assimilated to that which is inflicted on the principal. Accessories after the fact are generally punished with imprisonment proportioned to the heinousness of the original crime; but it scarcely ever exceeds two years, except in the case of receiving stolen goods. Those convicted of that offence are liable to fourteen years' penal servitude.

Formerly no accessory could be tried until after the conviction of the principal, but a man may now be tried and convicted either as accessory or for a distinct felony without waiting for the conviction of the principal, who may not be within the reach of justice, or who may have been acquitted through accidental failure of evidence.

The law of Scotland makes no distinction between the accessory to any crime (called *art and part*) and the principal.

The distinction between principals and accessories holds only in cases of felony, as in all crimes under that degree all persons concerned therein are held to be equally guilty as principals. In treason all concerned are regarded as principals on account of the heinous nature of the crime; but in treason-felony, though every accessory before the fact is punishable in the same manner as a principal, an accessory after the fact is only liable to imprisonment with or without hard labour for any term not exceeding two years.

ACCIACATU'RA (literally, a *crushing note*, Ital.), a short appoggiatura or grace note, played lightly immediately before the note it ornaments. It is written generally very



small in size, and in time value a quaver or a semiquaver, and should always be dashed across and be tied to its note. Unlike the appoggiatura it does not take from the time of the note it graces. See APPOGGIATURA.

ACCIDENTAL or COMPLIMENTARY COLOUR is a name given to that which an object appears to have when seen by an eye strongly affected at the time by some colour different from that which the object really has. Particular cases, in which remarkable accidental colours were formed, appear to have been long since observed; but Buffon was the first who made a series of observations to ascertain the colour of the image of which the mind acquires a perception when the eye has been for a time directed to an object of some particular colour; and it was he who gave the name of accidental colours to these

which are so perceived. In a "Mémoire" which he presented to the Académie des Sciences in 1743, it is stated that when his eye had been, for a certain time, directed steadily to a square spot of one of the following colours—red, yellow, green, blue, and black, the object being placed on a white ground, there was seen about the spot a fringe or border of one of the colours in the following series—green, blue, pale purple, pale red, and white, each of which, in order, is the accidental colour of the corresponding colour in the former series. Immediately afterwards, on directing his eye to a different part of the white ground, there appeared upon it a square spot of the same accidental colour, the white spot being considerably brighter than the ground. A border of accidental colour is constantly observed about an object when it has been, for a time, viewed intently; and in order that, by rendering it insensible, a coloured object may be seen as distinctly as possible, it is recommended that it be painted or formed on a ground whose natural colour is similar to that of the accidental colour peculiar to the object.

Observations have since been made with coloured spots on grounds of different colours, and from these have been ascertained, at the same time, the accidental colours of the spot and of the ground; for example, on contemplating a red square placed on yellow paper, and then turning the eye to white paper, it is found that the latter is of a blue colour, and that on it appears a square which is coloured green.

The explanation given of accidental colours in general is, that the eye being directed to a coloured spot, the part of the retina on which the image of the spot is formed becomes thereby weakened, so as to be in a great measure insensible to the action of rays of that particular colour; and thus, on the eye being afterwards directed to a white ground, it receives sensible impressions only from the rays of the remaining colours in the pencils of white light. In one of the hot-houses in Kew Gardens a visitor will notice that a few of the panes of glass in the roof appear pinkish, and on opening the door to go out he will be rather startled to find that everything which meets his eye—sky, trees, grass—all are of the most delicate rose colour; it is like a scene in fairyland, "where all is glistening show;" but before he has time to conjecture the cause the colours of earth have returned. The reader will doubtless at once be ready with the true explanation, that the glass used in the construction of this house is green, and the retina of the eye, being weakened by the undue stimulation of the green rays, is only able to perceive the complimentary pink rays in the ordinary white light from the open air, or through those panes of colourless glass which have been used in repairs.

ACCIDENTALS, in music. Every key except C requires one or more notes altered in pitch that they may occupy their due position relative to the key-note. [See KEY, SCALE.] Such alterations are effected by the *sharp*, ♯, which raises a note one semitone; the *flat*, ♭, which lowers it one semitone; the *natural*, ♮, which annuls the effect either of the sharp or of the flat; the *double sharp*, ×, which raises the note two semitones; and the *double flat*, which lowers the note two semitones. To reduce the double sharp and flat to a single sharp and flat, ♯♯, ♭♭ are required; to annul them altogether, ♯♯ would be used. The number of these signs required to alter the notes of the *natural* scale of C into the required scale is called collectively the *Key Signature* [see SIGNATURE], and this is placed at the beginning of the piece, on each staff. Any such signs required temporarily in the course of the piece are called *Accidentals*.

The history of these signs is curious, and is as follows:—The old mediæval music was written on natural notes only, consequently the scale or *mode* from each note

differed in the relation between the notes composing it and the key-note or tonic [see MODES ECCLESIASTICAL], whereas our own keys are all constructed upon the *sano* plan, differing only in pitch. The system of *hexachords* [see SCALE] attributed to Guido d'Arezzo (about A.D. 1025), but really probably of later date, attempted to better this want of what we now call *tonality* or feeling of key-relationship, by using small scales of six notes only, beginning on C, F, and G, and made on the same pattern. But since both the C and G hexachords had a perfect fourth from the key-note, it was necessary to lower the note B by a semitone when using the hexachord of F, so that it might be a perfect fourth to F; as not B, but B♭ fulfils this condition.

The new B was called B *molle* (whence the French *bémol* for flat), and was written with a rounded Roman b, which soon became our familiar ♭; whilst the old B was called B *quadratum*, because it was written in the usual square-shaped black-letter form which soon became our *natural*, ♮, and its name survives in the French *bécarre*, for natural. From meaning specially B flat, the sign ♭ came easily to be used to flatten any note required to the same amount (one semitone) as it flattened B; and the natural similarly enlarged its power, and was used to annul any ♭ by raising the note which had been flattened by a semitone. But the ♮ being thus one semitone above the ♭, two ♮♮ would be yet a semitone higher; and thus arose the sign ♯, used to raise a note a semitone above its natural pitch, and made by writing the two naturals so that the first stroke of the second ♮ cut the two cross strokes of the first in half, and slightly simplifying the figure thus made. Other writers consider, from early forms of the ♯, that it was B *quadratum* (or square B, B♮), crossed through or cancelled to show that the note to which it was applied was to be raised instead of lowered.

It is curious to note that the Germans, mistaking B *quadratum*, ♮, for their small A, wrote it as such, so that with them B stands for B♭, and H for B♮; and Bach was able to write fugues on his own name.



ACCIPITRES, among Birds, is an order which includes most birds of prey, living on animal food, and filling the place of the Carnivora, or beasts of prey, among the higher animals. To enable them to lead this predaceous life they are provided with strongly-hooked bills and sharp, powerful claws. The base of the upper part of the bill is covered with a "cero" or naked skin, in which the nostrils are pierced. The upper part of the bill is also provided, in the carnivorous Accipitres, with a sharp projection of its horny covering, closely resembling a tooth, which enables them more easily to tear their prey. The legs of the falcons and eagles are short and powerful, with three toes in front and one behind. In the vultures, however, the legs are somewhat longer, while the owls and the ospreys can turn their outer toe backwards so as to have two toes in front and two behind. The vultures (see Plate) have the head and neck naked, and are provided with very large and powerful wings. The most remarkable are the magnificent condor, a native of America, the largest of all the vultures; the lammergeier (fig. 5), found amidst the mountains of South Europe; and the secretary-bird (fig. 2), found in Africa, and feeding on serpents and reptiles, which differs considerably from the rest of its family. Among the falcons may be mentioned the martial eagle (fig. 6), the cream-bellied falcon (fig. 4), the sparrow-hawk, kite, osprey, and buzzard (fig. 1).

The owls (fig. 3) present considerable diversities from

the general character of the order. Since most of them hunt their prey by night, their plumage is very soft and loose, and this enables them to fly almost noiselessly. The eyes are directed forwards and the feathers of the face form a large circle round each.

All the members of this order live in pairs, and in all except the owls the females are larger than the males. See VULTURES, EAGLES, OSPREY, and OWLS.

ACCLIMATIZATION is a gradual change in the constitution of an individual or species, fitting it to endure a climate that was at first injurious. Mr. Wallace points out in what way this differs from *naturalization*, a term which can only be applied when a plant or animal, after removal to a new climate, runs wild without showing any trace of injury.

Animals appear better able to adapt themselves to a change in climate than plants, and this may be accounted for if we consider that animals have a natural heat of their own, and that their bodies, in most cases, are protected against extremes of cold by a non-conducting covering, and against heat by the action of the perspiratory ducts. With plants too, though to a less degree, there is a certain range of temperature (varying with different species) in which the functions may be carried on; thus it has been shown that maize will germinate between 10° C. and 42° C.

In addition to this constitutional capacity for bearing variations, there is every probability that individuals adapt themselves more or less to altered circumstances, since their organs are modified through the stimulus exerted by new conditions. But leaving individuals, we shall be treading on firmer ground if we take into account that the offspring, while inheriting to a certain extent the peculiarities of the parent, also vary in different directions. Some of one generation will thus be better fitted than the former for the new habitat, especially if the parent stock had begun to adapt itself. In seasons which happen to be extreme, if any individuals survive, they will be those which have varied most in the direction of adaptation, and in this way complete acclimatization will ensue. There is abundant evidence to show that if the changes in climate be great or sudden a decided check will be given to reproduction. It is therefore advisable, in attempting acclimatization, to choose intermediate stations, and move those individuals that are best fitted for it by careful breeding, gradually from one station to another. Acclimatization has of late years been much studied in England and France, and has also long attracted very considerable attention in Australia—a flourishing society for the introduction and propagation of fishes, birds, animals, and plants from Great Britain and elsewhere having been established in that colony. In order that every possible assistance may be rendered to the Acclimatization Society of Great Britain, the Admiralty direct all commanding officers in H.M. ships to afford every facility in their power to its accredited agents for the transmission of specimens from any part of the world. Her Majesty's consuls, colonial governors, and foreign ministers are also officially requested to procure all the information in their power on the subject, for the benefit of their fellow-countrymen.

ACCOLADE. This French word, derived from the Latin *ad*, to, and *collum*, the neck, signifies, in familiar speech, an embrace. Some have accordingly supposed that, when used as descriptive of a certain part of the ancient ceremony of conferring knighthood, the particular act which it denoted was the *embrace*, accompanied with a kiss, which was bestowed upon the new-made knight, in token of the brotherhood established between them by his admission into the order of chivalry. It has, however, been the more generally received opinion that the accolade was what we call in English (though perhaps improperly) the dubbing, the slight blow given to the cheek or shoulder

of the knight, "as an emblem," to use the language of Gibbon, "of the last affront which it was lawful for him to endure." There is no doubt as to the great antiquity of this last-mentioned custom, which is still observed in the conferring of the honour of knighthood.

ACCOMPANIMENT, in music, is the term applied to the subordinate part or parts of the harmony, which serve only to support a melody with suitable chords. Instrumental accompaniment to a vocal melody is the typical form; but instrumental accompaniment to a solo instrument (whether the solo is played on the same instrument as the accompaniment or on another), or choral accompaniment to a solo voice, or instrumental accompaniment to a chorus, are almost equally common.

An accompaniment may be *AD LIBITUM* (optional) or *obligato*. In the former case it serves to enrich the general effect, but is not, as in the latter, absolutely necessary to its completeness.

Accompaniments during the eighteenth century, and a little later, were usually written in *FIGURED BASS*, indicating only the bass and the harmony of the chords, and leaving the exact form of the accompaniment to the fancy of the performer.

ACCORDION, a small portable instrument with metallic vibrators of the free-reed species. [See *REED*.] The instrument has a small keyboard of from five to fifty keys, according to its size, and the right hand plays upon this, while the left hand works the bellows supplying the wind. Generally two keys are also placed near the position of the left hand, which supply not single notes but the entire chords of the tonic and dominant respectively. Thus a simple accompaniment becomes possible.

The instrument was invented by Daniel of Vienna in 1829. It is now quite superseded by the *CONCERTINA*.

ACCOUNT, a Stock-Exchange term used to denote the closing and settling of purchases or sales on particular days, termed account or settlement days. In consols and other English government securities, the various Indian loans and Bank of England stock, the settlement is monthly. The day is appointed in advance by the committee of the Stock Exchange, and is generally about the beginning of the calendar month. In the consol settlement all purchasers of stock are required to pay for it on the account day, and sellers are required to deliver the stock they have sold; but the differences which have arisen on closed or settled transactions are not paid or received until the day after, technically known as *Consol Pay-day*. In other securities, foreign and colonial bonds, railway stocks or shares, American and miscellaneous securities, the settlements are twice a month—about the middle and the end of the calendar month. The dates are appointed by the committee early in one month for that next ensuing, and the periods vary in length from twelve to nineteen days. The settlement occupies three continuous days, the third being the *Account or Pay-day*. The two previous days are known respectively as the *Contango* or *Carrying-over day*, and the *Name or Ticket-day*. On the first of these, those transactions which are open, and which it is not desired to settle, at the account, are carried over to the next. On the second the "tickets," bearing the names of the purchasers of registered stock, must be passed to the sellers. In bonds and securities to bearer the passing of tickets is optional, and prevails only to a limited extent. The *Account-day* is devoted to the delivery of stocks sold and the payment of differences that have arisen. From the great increase of capital of late years, and the facilities afforded by the telegraph for central operations, the Stock Exchange settlement has become one of the most important events of the financial world, and the returns of the Bankers' Clearing House for the past few years have shown that it is steadily increasing in magnitude and extent.

ACCOUNT, or **ACCOMPT**, was a form of action which in early times was much used for the recovery of money which a person had received and retained, and which it was his duty to hand over to the claimant. At present the action of account is rarely used.

ACCOUNTANT, a person who professes skill in mercantile accounts. In a commercial community occasions are constantly arising for the employment of accountants. They are generally appointed to examine the books of traders who have been compelled by embarrassment in their affairs to summon a meeting of their creditors; or they may be called in by a trader to investigate his accounts, and to ascertain the state of his affairs. The collection of debts or rents, and the winding-up of the affairs of persons deceased, or who have given up business, are matters often put into their hands. Appraisers and auctioneers frequently act as accountants. An accountant has no legal status, like a notary or an auctioneer or appraiser, who perform certain duties which only they are allowed to discharge.

ACCOUNT STATED. This is the title of the common count in an action at law for the amount due upon a balanced account between the parties, the form of which is that the defendant was indebted to the plaintiff in a certain sum of money found to be due from the defendant to the plaintiff upon an account then stated between them. This form should always be introduced in an action upon a simple contract for the recovery of a pecuniary demand.

Though a member of a copartnership cannot in general sue his copartner at law for his share of the profits, he may do so after an account has been stated between them, and a balance struck in his favour. But it is necessary in all cases of an account stated that there should have existed some claim against the defendant, or some previous transactions in respect of which the account is stated, for an action cannot be brought in this form upon a mere agreement to pay a sum of money. The statement of an account is only presumptive evidence against the party who admits the balance to be against him, and does not preclude him from showing the existence of error in the account, unless in the case of an account actually settled by payment, which cannot be opened except by proof of fraud. (Chitty on "Contracts," 618 et. seq., 3rd ed.)

ACCRA or **ACRA**, a district on the Gold Coast, W. Africa, called after the name of a native tribe of whose territory it formed part. Fort St. James protects the town of Accra, to which the seat of government was transferred from Cape Coast Castle, about 75 miles distant, in 1874. It is one of the healthiest stations on the coast, and exports ivory, gold dust, gums, coffee, and palm-oil.

ACCRINGTON is an important manufacturing town and municipal borough in Lancashire, 19 miles north of Manchester, and 211 from London by the Midland Railway. It lies in a deep valley on the banks of the river Hindburn. It is in the neighbourhood of numerous coal-pits, contains extensive cotton factories and bleachfields, and is a centre of the Manchester cotton-printing business. Among the finest public buildings are the Peel Institution, an Italian edifice, with spacious assembly room, reading rooms, &c.; and an elegant Gothic Unitarian chapel. The church of St. John, a plain cruciform building, was erected in 1869; but the most ancient is that of St. James, which dates from 1551, and was rebuilt in 1763. There are extensive reservoirs near the town. The vill of Alkington existed here in Saxon times. The population of the municipal borough in 1881 was 31,435—an increase of 9647 since 1871.

ACCUMULATION. An act of Parliament (39 & 40 Geo. III. c. 98), after declaring in the preamble that "it is expedient that all dispositions of real or personal estates, whereby the profits and produce thereof are directed to be

accumulated, or the enjoyment thereof postponed, should be made subject to the restrictions hereinafter contained," proceeds to enact to the following effect:—No person can settle or dispose of property by deed, will, or otherwise, so as to accumulate the income thereof, either wholly or partially, "for any longer term than the life or lives of any such grantor or grantors, settlor or settlors, or the term of twenty-one years from the death of any such grantor, settlor, devisor, or testator, or during the minority or respective minorities of any person or persons who shall be living or in *rente sa mere* at the time of the death of such grantor, devisor, or testator, or during the minority or respective minorities only of any person or persons who, under the uses and trusts of the deed, surrender, will, or other assurances directing such accumulations, would for the time being, if of full age, be entitled to the rents, issues, and profits, or the interest, dividends, and annual produce so directed to be accumulated. And in every case where accumulation shall be directed otherwise than as aforesaid, such direction shall be null and void, and the rents, issues, profits, and produce of such property so directed to be accumulated shall, so long as the same shall be directed to be accumulated contrary to the provisions of this act, go to and be received by such person or persons as would have been entitled thereto if such accumulation had not been directed." Sect. 2 provides, "that nothing in this act contained shall extend to any provision for payment of debts of any grantor, settlor, or devisor, or other person or persons, or to any provision for raising portions for any child or children of any person taking any interest under any such conveyance, settlement, or devise, or to any direction touching the produce of timber or wood upon any lands or tenements; but that all such productions shall be made and given as if this act had not passed." Sect. 3 provides that the act shall not extend to dispositions of heritable property in Scotland.

ACCUMULATION OF POWER is a term applied to that quantity of motion which exists in some machines at the end of intervals of time, during which the velocity of the moving body has been constantly accelerated.

The simplest case in which there is such an accumulation of power is that of a heavy body, like the rammer of a pile-driving machine, which descends by the action of gravity during a certain time, and impinges upon some object. At the moment of impact, supposing that the object struck does not move, the velocities of all the particles, which had gone on continually increasing during the descent, are destroyed, and thus a shock is produced immensely greater than that which would result from the mere pressure of the body. In all cases, the effect, if measured by the magnitude of an impression or indentation produced in the object struck, is, by the laws of mechanics, directly proportional to the mass in motion, and to the square of the velocity at the instant of impact.

If the effect of impact at the circumference of a revolving wheel be considered as proportional to the diameter of the wheel and to its mass (supposed to be collected in its circumference), and it be represented by $r w$, r being the radius and w the weight of the wheel; then, the effect at working point, when the latter is connected with the axis of revolution at a distance from it represented by r' , being to the effect at the circumference of the wheel as r to r' , it will follow that the effect at such working point must vary directly as $r^2 w$, and inversely as r' ; hence, it is more advantageous to increase the diameter of the wheel, or its velocity, than its weight. In practice, however, there are certain limits both to the magnitude and the velocity of the wheel which must not be exceeded, lest the centrifugal force arising from the revolution should destroy the cohesion of the parts.

ACCUSATIVE CASE. See DECLENSION.

ACEPHALA (α , not, and $\alpha\iota\phi\alpha\lambda\acute{\alpha}$, head) is a division of molluscous animals. The MOLLUSCA are roughly divided into Encephala and Acephala, according as they possess or lack a distinctly differentiated head. The Acephala—otherwise the LAMELLIBRANCHIATA—have no head, and the mouth, situated at the anterior end of the body, opens into the stomach through a gullet. Woodward, in his "Manual of the Mollusca," observes—"The Acephala appear to exercise little discrimination in selecting food, and swallow anything that is small enough to enter their mouths, including living animalcules, and even the sharp *apicula* of sponges."

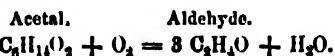
The Acephala include most of the bivalve molluscs, such as oysters, mussels, &c.

ACER. See MAPLE.

ACERINÆ, a tribe of plants comprehending only the maples (*Acer*), the ash-leaved maples (*Negunda*), and *Dobinea*. They belong to the polypetalous order SAPINDACEÆ, and are known—1, by their flowers being what is called unsymmetrical, that is, the parts of the corolla, stamens, and pistil do not agree in number; 2, by their stamens being inserted upon a disk below the ovary; 3, by their two-celled winged fruit (*samaras*); and, 4, by their petals having no appendages upon them. The Acerinæ are all trees or shrubs, with opposite stalked leaves without stipules. They are found exclusively in the north of Europe, Asia, America, and India. A sweet mucilaginous sap is common in these plants, from which sugar can be manufactured. The timber is light but useful. The bark is astringent, and from it are obtained reddish-brown and yellow colours used in dyeing. See MAPLE.

ACERRA, the ancient *Aceræ*, a town in the province of Caserta, Southern Italy, 9 miles north of Naples by railway. Population, 15,000. The neighbourhood suffers from malaria, owing chiefly to its being intersected by some half-stagnant canals. The town had the privileges of Roman citizenship conferred on it as early as 332 B.C.

ACETAL ($C_6H_{11}O_2$), a mobile colourless liquid, of an agreeable ethereal odour. Specific gravity, 0.821. Boils at about 105° C. (221° Fahr.) It dissolves in eighteen times its volume of water, and is miscible with alcohol in all proportions. It is a product of the oxidation of alcohol, and was discovered by Döbereiner in the course of his investigation of platinum black. When alcohol vapour, at 20° C., permeates platinum black which has been previously exposed to the atmosphere, it undergoes slow combustion at the expense of the oxygen condensed on the platinum black, and is converted into aldehyde, acetic ether, acetic acid, and acetal. Acetal is also prepared by distilling two parts of alcohol with three parts of binoxide of manganese, three parts of sulphuric acid, and two parts of water. The distillate contains aldehyde, acetic ether, acetal, &c. The acetal is separated by successive distillations after treatment with caustic potash. Acetal is rapidly converted first into aldehyde, into acetic acid by contact with platinum black, by nitric acid, or by chromic acid. The action is:—



With chlorine it forms mono-, di-, and tri-chloroacetal. Hydrochloric acid dissolves it, forming chloride of ethyl.

ACETATES. There are three classes of salts of acetic acid—normal, acid, and basic. Normal acetates are monobasic. They are all soluble in water, the least soluble being the acetates of silver and mercury; hence most acetates are produced by the action of acetic acid upon the oxides or carbonates of the respective bases. All acetates are decomposed by heat. Those containing weak bases, when subjected to distillation, yield much acetic acid, the remaining portion of the distillate being acetone, carbonic

acid, and empyreumatic oil. Occasionally, as in the case of copper and silver acetates, the residue consists of the reduced metal and charcoal. Acetates containing a strong base are converted by heat into carbonates, acetone being given off. Heated with sulphuric acid and alcohol, acetates give off acetic ether; with lime, they furnish acetone; and distilled with caustic potash, they yield marsh gas.

The acetates are a very important class of compounds. The acetate of alumina (triacetate of aluminium), $Al_2O_3(C_2H_3O_2)_3$, is largely employed as a mordant by calico printers. It exists only in solution, and is generally prepared by precipitating alum with acetate of lead: the solution contains also sulphate of potassium. A mixture containing ferric acetate and ferrous acetate is made by treating iron with wood vinegar (pyroligneous acid), and is used as a mordant for black dyes. Acetate of lead or sugar of lead, $Pb_2(C_2H_3O_2)_3$, is prepared by dissolving litharge with heat in strong vinegar; it is exceedingly poisonous.

Acetate of copper (verdigris), and a mixture of acetate and arsenite of copper, known as "Schweinfurt green," are used for paints and for printing wall papers. Acetate of lime is prepared as one of the steps of the manufacture of acetic acid by the destructive distillation of woods.

ACETIC ACID ($C_2H_4O_2$), the acid principle of vinegar, and that to which its peculiar and valuable properties are owing. This liquid has been known in the dilute form from the remotest antiquity. It is procured in two conditions—acetic anhydride or anhydrous acetic acid, and acetic acid. Acetic anhydride ($C_4H_6O_3$) was discovered by Gerhardt. It is a colourless liquid of high refracting power, having a pungent odour. It absorbs water from the air and becomes gradually converted into the ordinary acid. Acetic acid exists in nature in the juices of some fruits and the sap of many trees, but in insufficient quantity to render its extraction profitable. It is prepared in a great variety of ways, its most frequent source being the oxidation of alcohol, or the destructive distillation of certain woods. When saccharine solutions undergo vinous fermentation alcohol is produced; to procure vinegar this process is carried a further stage. What is called acetous fermentation ensues, and the alcohol is converted first into aldehyde and then into vinegar. How this is managed in practice is explained under VINIGAR. Acetic acid mixes with water in all proportions. The hydrate containing two equivalents of water, corresponding to a mixture of 77.2 per cent. acid and 22.8 per cent. water, has the maximum density, viz., 1.073, it being somewhat remarkable that a mixture containing more or less water has less specific gravity. At or below 62° Fahr. (17° C.) pure or glacial acetic acid crystallizes in radiating tufts of tabular or prismatic plates. In closed vessels it remains liquid considerably below this temperature, and does not solidify until the vessel is opened and shaken. Its specific gravity in the solid state is 1.100 at 34° Fahr. It boils at 248° Fahr. (120° C.) Its vapour is highly combustible, and burns with a pale blue flame, producing by its combustion water and carbonic acid. Acetic acid does not redden litmus paper unless mixed with water. It blisters the skin and acts as an acrid poison.

The acetic acid of commerce is chiefly obtained by distillation of the harder kinds of wood, particularly the oak, beech, birch, and ash, in hollow iron cylinders, the temperature being gradually raised to a dull redness. The wood is usually put in the retorts in open iron cases, so that the charge may be rapidly introduced and the charcoal as quickly withdrawn. The quantity of acid produced is 1.5 to 3.5 per cent.; in the crude state it is known as pyroligneous acid (Greek, $\piυρ$, fire; and Latin, *lignum*, wood). A large quantity of tarry and oily matter distils over, containing wood spirit (or methylic alcohol),

methyl acetate, and pyroligneous acid. Purification is effected by roundabout processes, since it is impossible to separate the tarry matters by distillation. The liquid is therefore neutralized with milk of lime, the tar which rises to the surface skimmed off, and the solution of calcium acetate, after being clarified by long standing or filtration, is boiled down to half its bulk, and treated with hydrochloric acid. The remainder of the tarry matter separates and is skimmed off, and the creosote and other volatile impurities are expelled by heat. The acetate of lime is finally dried, decomposed with hydrochloric acid, and distilled. If the acetic acid thus obtained contains hydrochloric acid, it may be purified by redistillation with 2 or 3 per cent. of potassium bichromate.

ACETONE (C_3H_6O), *Pyroacetic Spirit*, is produced in the destructive distillation of acetates. It is also obtained by passing acetic acid in vapour through a red-hot tube, or by heating starch, gum, sugar, tartaric acid, citric acid, or other vegetable substances with quicklime. Acetone is a colourless, limpid, very mobile liquid; its odour is peculiar—penetrating and somewhat aromatic; its taste is pungent and something like that of peppermint. Its specific gravity is 0.792. It boils at $56^\circ C.$, and the density of its vapour is 2.0025. It mixes in all proportions with water, alcohol, ether, oil of turpentine, and many compound ethers. It dissolves camphors, fats, and resins. Chlorine in the presence of alkalies converts acetone into chloroform.

ACETYLENE (C_2H_2), a gaseous hydrocarbon of specific gravity 0.92, having a peculiar disagreeable odour, and burning with a very bright and smoky flame. It is one of the constituents of coal gas. It is produced by direct combination of hydrogen and carbon in the voltaic arc by passing olefiant gas, marsh gas, or the vapours of alcohol, ether, or aldehyde through a red-hot tube into an ammoniacal solution of cuprous chloride. Decomposing with hydrochloric acid the red precipitate which is thrown down, pure acetylene is given off.

Acetylene unites with silver and copper, producing detonating compounds. Serious cases of explosions occurring when gas pipes were under repair have been traced to the presence of acetylides. Brass and copper are therefore improper materials for gas service pipes. Acetylene when mixed with chlorine explodes spontaneously.

ACHÆAN CONFEDERATION OR LEAGUE.

The Achæans, who formed that federal union which is commonly called the Achæan League, inhabited the tract which lies along the southern coast of the Corinthian Gulf (Gulf of Lepanto). They formed twelve small independent states. The history of the Achæans is an inconsiderable part of the general history of Greece till about B.C. 251, when ARATUS having freed Sicyon (not an Achæan town) from a tyrant, brought it over to the confederacy, of which he was elected general in B.C. 245. Corinth, Megaris, Epidaurus, and Trœzen also became members of the League. During the long career of Aratus other Peloponnesian states were included in the union; and in fact Aratus is called by Polybius the founder of the confederation. In the year B.C. 208, five years after the death of Aratus, Philopœnen was elected general of the confederacy. In 191 Sparta became a member of the Achæan League, and the design of its leaders was to include all the Peloponnesus within its limits. After the death of Philopœnen (B.C. 183) the Roman party, which had been established in Greece after the defeat of Philip V. of Macedonia (B.C. 197), grew still stronger under the influence of Callicrates, and the League remained, in appearance at least, on the side of the Romans in their final struggle with Perseus, king of Macedonia, which ended in the defeat of the king (B.C. 168).

The last war of the League was with Sparta, which was occasioned in B.C. 150, through the influence of Critolœus.

This, which the Romans considered as a kind of attack on themselves, joined to the contumacious treatment of some Roman commissioners at Corinth, induced the republic to send L. Mummius to chastise the Achæans. The Achæan general, Diœus, met Mummius on the Isthmus of Corinth, and fell an easy prey to the Roman general, who, after the battle, burned Corinth to the ground (B.C. 146). Mummius and ten other senators then changed Greece into the Roman province of Achæa, leaving, however, to certain cities, such as Athens, Delphi, and others, the rank of free towns. Corinth afterwards received a Roman colony.

Each state which belonged to the Achæan League had equal political rank, retained its internal regulations, and its coins, weights, and measures, though the general government also had its coins, weights, and measures, which were uniform. The ordinary general assemblies were held twice a year, and they deliberated for three days. The assemblies decided upon all matters which affected the general interest, on war and peace, and made all such regulations as were required for the preservation of the union. At the spring meeting, about the time of the vernal equinox, the public functionaries were chosen; the *stratêgos*, or general of the confederation, was there chosen, with the *hipparchus*, or master of the horse, who held the next rank, and ten functionaries called *demiurgi*; there was also a chief priest chosen to superintend the religious affairs of the confederation.

It may be asked, How was the general council composed, particularly after the League comprised within itself so many states? Did the states send deputies? Had they, in fact, a representative government? It is difficult to answer that question, though we are inclined to think that there was no strict system of representation. The short time for discussion, the meetings twice a year, the general character of Greek democracy, as well as most passages in which the congress is spoken of, lead us to infer that this deliberative body consisted of every qualified citizen of the confederate states who chose to attend. It appears that all the citizens of the several states who were thirty years of age, and rich enough not to carry on any handicraft in order to get a living, might attend the yearly meeting, speak, and vote.

The chief modern authority is Helwing's (German) History of the Achæan League; the chief ancient authority, Polybius.

ACHA'IA or **ACHÆA**, one of the ancient divisions of the Peloponnesus, now with Elis forming a department of modern Greece, extended from the river Larissus, near Cape Araxus, along the south of the Gulf of Corinth (Gulf of Lepanto), as far east as the small territory of Sicyon, which separated it from that of Corinth. The Sythas, a petty stream, separated Achæa from Sicyonia. The greatest length, in a straight line, between the western and eastern boundaries, is about 65 English miles. The breadth of the province varies irregularly from about 12 to 20 miles. Being for the most part only a narrow slip between the Arcadian mountains and the sea, the courses of the numerous streams that flow into the Corinthian Gulf are short, and many of them are quite dry in summer. The land, however, is fertile, and produces corn, wine, and oil.

The province contains many defiles and mountain-passes formed by branches of the great Arcadian ridge, which, in some parts, run down to the Corinthian Gulf. The coast is generally low, and has few good ports.

Before this country was occupied by the Achæi, it was called *Egialos*, afterwards *Ionis*, and sometimes *Egialeian* *Ionis*, which probably means no more than "Ionis on the sea-coast;" it then contained twelve cities or states. The same number of political divisions subsisted under the Achæi in the time of Herodotus. At present Patras, situated on the coast, about 6 miles from the entrance of the Gulf of Corinth, is the only Achæian town of any importance.

After the Roman conquest of Greece, the province of Achaia was greatly extended, and comprised all Peloponnesus, with Northern Greece south of Thessaly; the rest of Northern Greece belonged to Macedonia. But it is exceedingly difficult to fix the precise limits of the Roman provinces of Macedonia and Achaia. Nicopolis, a town which Augustus built near the northern entrance of the Ambracian Gulf (now the Gulf of Arta), to commemorate his victory at Actium, is included by Tacitus in the province of Achaia.

ACHARD, FRANZ KARL, was born at Berlin, 28th April, 1754, and died 20th April, 1821. He was the author of various works, written in German, on experimental physics, chemistry, and agriculture. In 1780 he published "*Chymisch-Physische Schriften*," which contains a great number of experiments on the subject of the adhesion of different bodies to each other.

Achard is, however, chiefly known for his proposal to extract sugar from beet-root. Another Prussian chemist, Margraff, had discovered the existence of a certain portion of sugar in this root as early as 1747, but deemed his discovery of little practical importance. Achard, on the contrary, described beet-root as "one of the most bountiful gifts which the divine munificence had awarded to man upon the earth." The Institute of Paris, in 1800, honoured him with a vote of thanks, but reported unfavourably of the practicability of his plan. Napoleon, however, in 1812, formed an imperial manufactory at Rambouillet, when the plan of Achard was put in practice, and partly succeeded. Since then the manufacture of sugar from beet-root has been carried on very extensively in France.

ACHEEN or **ATCHEEN**, a division in the north-west of Sumatra, and which, like the rest of the island, now belongs to the Dutch. Acheen has long been known as a country of great commercial importance. Rice and pepper form the chief products. The exports consist of betel-nuts, sulphur, gutta-percha, camphor, benzoin, gold-dust, &c. Large quantities of opium are imported, as well as salt, iron, and European manufactures. The inhabitants differ greatly from the Malays, and are believed to be of Moorish descent. They number about 300,000. The town of the same name on the north-west extremity forms the capital. It is situated near the foot of the Golden Mountain, which is 6000 feet in height, and forms part of a volcanic range. It lies 3 miles from the sea, on the banks of a small river, which discharges itself by three mouths. The delta thus formed makes the town difficult of access, but there is a good anchorage outside. The chief feature of the place is the palace of the sultan. Population, 36,000.

ACHELOUS, now *Aspro Potamo*, or *White River*, is the largest river in Greece proper. The Achelous rises in the lofty mountain range of Pindus, and after flowing through a very uneven country enters the level land of Acarnania. Here it discharges itself into the Ionian Sea. In ancient times the town of *Goniada* was near its outlet. Its general course is from north to south, and its length is 130 miles. In the time of Thucydides (n.c. 431) the lower waters of the Achelous were considered as belonging to Acarnania, but at a later period they formed a boundary between Acarnania and Etolia; the banks are said to have been the haunt of lions. At its mouth are several alluvial islands, which in ancient times were called *Echinades*. Great changes have taken place in the number and position of these in the lapse of ages. Homer speaks of the *Echinades* as sending troops to Troy; Herodotus observed their alluvial formation; Thucydides speaks of their increasing numbers, and predicted their junction to the mainland, but says they were uninhabited in his time. Achelous was widely worshipped as a god.

ACHENE, a term used in botany. To explain it

we may take the buttercup, after the flower has fallen. The ripe fruit consists of a head of bodies, distinct from one another. On examination each of these will be found to consist of a skin-like covering (*pericarp*), and one seed inclosed. The pericarp is separate from the seed, and does not split to let it drop out (*indehiscent*). Each of these distinct (*apocarpous*) bodies (*carpels*) is called an *achene*. Another example is the strawberry fruit, in which each of the dry, apocarpous, indehiscent, one-seeded carpels, scattered over the surface of the fleshy head, is an *achene*.

A'CHERON, a small stream of Elis, in Greece, which runs into the Alpheus. Acheron was also the name of one of the rivers of the realms below, over which the dead were fabled to pass. There was another Acheron in Threspotis, a part of Epirus; this stream rises in the mountain range of Pindus, forms in its course a considerable lake, called Acherusia, and finally enters the Ionian Sea, forming a bay now called Porto Phanari. There was a third river called Acheron, in Southern Italy. All these rivers at one time or another were believed to communicate with Hades. The name Acherusia was also given to the Luerine Lake, or else to the Lake of Avernus, in Italy; and the hot springs in the neighbourhood were supposed to be near Pyrophlegethon, or the river of fire in the infernal regions. On the coast of the Euxine, near Heraclea (Erekli), there was a peninsula called Acherusia, where Hercules is said to have descended to bring up the dog Cerberus.

A'CHILL or **EAGLE ISLAND** lies off the west coast of Ireland, and forms part of county Mayo. It is about 15 miles long by 12 broad, irregular in shape, and wild and picturesque in appearance. The island has an area of 35,000 acres, and is the largest on the Irish coast. It is very rugged and mountainous, being, in fact, chiefly a mass of mica slate. Achill Head, the highest point, is over 2200 feet above the sea. The soil is mostly boggy, and the inhabitants, who number over 3000, live in wretched hovels.

ACHIL'LES, the hero of the Iliad, was the son of Peleus, king of the Myrmidons in Thessaly, and of the sea-goddess Thetis, daughter of Nereus.

The Iliad, which deals with a part only of the story of the siege of Troy, has nothing concerning his life before that period, and it comes to a conclusion before his death. By later poets and writers, however, the full story of his life has been preserved, and the following is the outline of it:—

He was, in his childhood, dipped by his mother in the river Styx, so that he was rendered invulnerable, with the exception of the heel by which she held him. This story gave rise to the use of the term "the heel of Achilles," to denote any point of weakness. He was brought up by the good centaur Cheiron, who instructed him in medicine, and he was taught eloquence and the arts of war by Phoenix. Thetis was offered by the gods, for her son, either a long life, to be spent in obscurity, or a short life of fame and glory; and choosing the former she concealed him at the court of Lycomedes, in the island of Skyros, where he was disguised as a girl and brought up among the king's daughters. He gained the love of one of these, named Deidamia, who bore him a son, Neoptolemos, who, after his father's death, took part in the war against Troy. While in seclusion at Skyros, Achilles was sought after by the Greeks, who wanted his help against Troy, and Ulysses was sent to discover him and enlist his services. He accordingly went disguised as a merchant, and while offering the king's daughters his trinkets and wares, displayed a splendid suit of armour, the sight of which awakened the enthusiasm of Achilles, who forthwith offered his services in the war. His father Peleus sent Patroclus

to be his companion, and he set out with the expedition at the head of fifty ships, manned by his followers the Myrmidons.

In the first book of the Iliad he is represented as retiring in anger from the Greek army, because the leader, Agamemnon, had deprived him of a beautiful maiden named Briseis, whom he had taken captive from the town of Pedasos. His cause was espoused by his mother Thetis, who appealed to Zeus, and the Greeks were doomed in consequence to meet with defeat and disaster until Achilles was reconciled and returned to the conflict. In the subsequent engagements with the Trojans they were accordingly defeated, and from besieging the city were driven back to the shelter of their own fortified camp. This led Agamemnon to attempt to appease the anger of Achilles, and he offered to restore Briseis, to give him, in addition, his own daughter in marriage, and to bestow upon her seven towns as a dowry. Achilles, however, stubbornly refused to be reconciled; and the Trojans again attacking under Hector, succeeded in partially storming the Greek camp and in setting some of the ships on fire.

On this Patroclus interceded in behalf of the Greeks, and received permission to equip himself in the armour of Achilles and to lead the Myrmidons to the rescue. He succeeded in saving the camp, but having, contrary to the advice of Achilles, followed in pursuit, was slain by Hector, who also carried off the armour of Achilles which he wore.

This double loss aroused the hero to action; and after effecting a reconciliation with the Greek leaders, and being supplied with a fresh suit of armour made by Hephaestus, at the request of Thetis, he returned to the conflict determined to avenge the death of his friend. On the field of battle he attacked with such fury and prowess as to carry everything before him, and finally encountering Hector in single combat, killed him, and dragged his body in triumph round the walls of Troy. He then burned the body of his friend Patroclus with ceremonies of great splendour, and afterwards, at the request of the aged Priam, gave up the body of Hector to his relatives in Troy. The account of the burning of the body of Hector brings the Iliad to a close. After the death of Hector the Trojans received assistance from the Amazons, whose queen, Penthesilea, met Achilles in single combat, and was slain by him. Memnon, the son of Eos and Tithonus, was also amongst the many heroes slain by Achilles.

Achilles met his fate when leading on the Greeks to the storm of Troy. Paris, the brother of Hector, aimed an arrow at him, the god Apollo drove the weapon towards the fatal heel, and Achilles fell at the Scæan gate of the city. The Greeks rescued his body, and celebrated the funeral with great solemnity. The Muses descended from heaven in honour of the event, and mourned for the death of the hero. His ashes were placed in an urn with those of Patroclus, and buried on the promontory of Sigeum, under an imposing mound. His armour was claimed by Ulysses and also by Ajax, and the award being given in favour of the former, Ajax became the victim of insanity and committed suicide.

In the Odyssey an account is given of the visit of Odysseus (Ulysses) to the world of spirits, where he met and conversed with the shade of Achilles. This passage is frequently referred to as throwing some light upon the opinions of the early Greeks as to a future state; and it is worthy of note that when congratulated by Odysseus on his being a king over the shades, Achilles is made to reply, "I would rather toil as a day labourer on the earth than reign here a prince of dead multitudes."

ACIDS, in chemistry, the salts of hydrogen, i.e. compounds of hydrogen with electro-negative radicles. The acids are a numerous and important class of chemical bodies, occurring in all the kingdoms of nature, and

possessing very diverse qualities. Some acids are gaseous, some liquid, and others solid at common temperatures; some are transparent, and others coloured; some inodorous, and others pungent; some volatile, and others fixed. They are generally sour (whence their generic name, from the Latin word *acidus*, anything sour), are soluble in water, decompose carbonates, and change to red most organic blue and violet colours. In chemistry the term is applied to many substances which possess none of these qualities, and denied to some others which do possess them. It is now considered that acids do not form a class essentially different from all other bodies in their nature and qualities, but that they are salts of hydrogen which unite readily with alkalies, exchanging their hydrogen for metals or for radicles possessing metallic characteristics. Oxygen, which, as its name implies, was formerly considered the acid generator, is now dethroned in favour of hydrogen.

Chemists no longer consider as acids such substances as carbonic acid (CO_2), nitric acid (N_2O_5), sulphuric acid (SO_3), and the like. Though continuing to use the name by which they are commonly known they view them as oxides, recognizing the compounds of these bodies with water as the true acids. Thus carbonic acid (though it has never been isolated), is inferred, as having the composition H_2CO_3 , that is, $\text{CO}_2 + \text{H}_2\text{O}$; nitric acid (HNO_3), as being a compound of nitric anhydride (N_2O_5) with water, that is, half ($\text{H}_2\text{O} + \text{N}_2\text{O}_5 = \text{HNO}_3$); and sulphuric acid, in like manner the hydrate of sulphuric anhydride ($\text{H}_2\text{O} + \text{SO}_3 = \text{H}_2\text{SO}_4$).

Acids are ordinarily divided into three classes—mono-, di-, and tri-basic acids. Monobasic acids cannot form acid salts, or salts with two or more metallic bases. Dibasic acids can form a neutral and an acid salt, and also double salts. Tribasic acids can form three distinct salts with the same base, two acid and one neutral, and also produce double, triple, and hybrid salts.

Of the many hundred acids with which we are acquainted nearly all belong to the organic kingdom, and fresh acids are being constantly discovered or produced by the combination of those already known.

All the principal acids are described under the letter of the alphabet to which they respectively belong.

ACI REALE, an important town in the province of Catania, Sicily, situated at the mouth of the small river Aci, and at the foot of Mount Etna. It has been almost entirely re-erected since an earthquake in 1693, and stands on several different lava streams, 560 feet above the sea. The climate is very healthy, and there are extensive baths, which are much frequented. There are some manufactures of silk, cotton, and linen, and a trade is carried on in flax, cutlery, filigree-work, and grain. The population is 25,000; or, with the surrounding villages, 40,000. The environs are replete with geological interest; and the myth of Aci is associated with this locality.

A'CIS (*'Ams*), a youth beloved by the nymph Galatea. Polyphemus the Cyclops, his rival, pursued him, and hurling a huge rock at him, crushed him under its weight. His blood was turned at Galatea's prayer into a limpid stream, which bore his name (the modern Aci), and watered the foot of Etna. The story is told in Theocritus and in Ovid's "Metamorphoses" (xiii.), and probably is due to the way in which the river Aci springs forth from under a rock. Aci and Galatea is the subject of one of Handel's most charming works.

ACONITE, Monkshood, or Wolfsbane are common names for Aconitum, a genus of poisonous plants belonging to the natural order RANUNCULACEÆ. From early times it has borne the same name, and has been known for the dangerous properties of many of its species. They are all hardy herbaceous plants, many of them of great beauty; and are so easily cultivated that one of them, *Aconitum Napellus*, is found in almost every cottager's garden. The

English name *wolfbane* corresponds with the French *lue-loup* (kill-wolf). Aconitum is at once known from all other ranunculaceous plants by its having the very large uppermost segment of its coloured calyx overhanging the petals and other parts in the form of a helmet.

The common species, *Aconitum Napellus*, is one of those in which the greatest degree of virulence has been found to reside. It is a native of Alpine pastures in Switzerland and other mountainous parts of Europe, and is rarely found wild in Britain. Its leaves are very dark green, deeply cut into from five to seven long segments. The stem is about 3 feet high. The flowers are in long stiff spikes, and of a deep blue colour; they appear from May to July. All the parts of this plant are extremely acrid, especially the roots, which are scraped and mixed with food to form a bait for wolves and other savage animals. The juice of the leaves, introduced into the stomach, occasions death in a short time; the root is far more energetic. The poison acts upon the nervous system, especially the brain, producing a sort of frenzy. *Aconitum Cammarum*, *Lycotomum*, and *anthora* are certainly equally dangerous. None of them, however, can be compared for fatal energy with the *Aconitum ferox* of Nepal, which seems to possess the concentrated power of all the European species. From it is prepared the dreadful *bikh* or *bish* used for poisoning arrows. Hooker and Thomson think this plant to be a variety of *Aconitum Napellus*.

The official parts of Aconitum in medicine are the root and leaves, but the seeds might be added with propriety. Every part of the plant has a narcotico-acrid property. The live plant has little of the viscid repulsive odour common in poisonous vegetables. Honey collected from the flowers has caused severe suffering and even death. A small piece of the leaf, root, or a single seed, if chewed, causes a feeling of tingling, followed by numbness of the lips and tongue, which lasts for hours. In medical practice, however, there are few drugs that are of greater value than aconite. Taken internally it exerts a wonderful power over inflammation and its accompanying fever, and for such diseases as quinsy or tonsillitis, pleurisy, and inflammation of the lungs, it is simply invaluable. It is also a powerful auxiliary in the treatment of complaints like scarlet fever or measles, and may be used with advantage in rheumatic fever, gout, or erysipelas. Used in the form of a liniment it will also often relieve the pain caused by tic or neuralgia. A convenient method of using this remedy is to mix two parts of the aconite liniment with one part of the chloroform liniment, and to paint lightly the affected part with the mixture. As this mixture is poisonous care must be taken in using it not to let any run into the eyes or mouth, or into any crack or wound in the skin. Should poisoning from aconite occur the stomach should be immediately emptied by an emetic or the stomach pump, after which stimulants should be administered and care taken to maintain the bodily heat of the patient. Of course so powerful a poison should only be employed under medical advice. There are no chemical tests, but it may be known by its physiological effects, its unmistakable taste, and its poisonous action on a small animal. The root-stock of aconite has occasionally been mistaken for horse-radish, with fatal effects. It is necessary, therefore, to point out the difference. The two plants are so dissimilar that it is only when they have died down that any mistake can occur with the root-stocks. Aconite has tapering root-stocks, smaller than the horse-radish, of a dark-brown colour, white internally. Horse-radish does not taper, is of a yellowish colour externally, a pungent taste, and has scars on its crown, marking the position of the decayed leaves.

Winter aconite is quite a different plant. Its botanical name is *Eranthis hyemalis*. It is a pretty plant, enlivening our gardens with its bright yellow flowers in the early

spring. There are three stalkless leaflets just below each flower.

ACONITINE ($C_{30}H_{47}NO_7$), a vegetable alkaloid which exists in considerable quantity in the leaves and roots of the *Aconitum Napellus* (monkshood) and other acrid aconites. It is used in medicine to diminish pain, particularly in neuralgic affections, and also to diminish the activity of the heart in inflammatory diseases. Medicinal tinctures, and extracts prepared from the roots of the plants, are the most powerful. They contain also aconelline, napelline, acolyetine, and lycoctonine—a group of alkaloids having properties very analogous to aconitine. Pure aconitine is best prepared from the leaves of the plant. These are exhausted with alcohol, and the aconitine extracted from the solution by conversion into sulphate and subsequent precipitation by carbonate of potassium.

Pure aconitine separates from its solution in dilute alcohol in white grains, or in the state of a vitreous transparent mass. It is inodorous, but has an intensely bitter and acrid taste. It is extremely poisonous, one-fiftieth of a grain being sufficient to kill a sparrow in a few minutes, and one-tenth of a grain instantly. Swiss aconitine is much less poisonous than the English, as is also a "crystallized aconitine" prepared by treatment with tartaric acid and exhaustion by alcohol.

ACONTIAS (from *ἀκοντίας*, a quick-darting serpent), a genus of snake-like reptiles belonging to the section Anguils of Cuvier, but retained by most modern authors within the limits of the Lizard group, of which, with many others, it forms a section intermediate between the true lizards and the true snakes. Dumeril and Bibron place it in the subfamily Saurrophthamæ, belonging to their eighth family of Saurians, the Scincoidians. The animals of this family are not all footless; but even in such as are so an imperfect pelvis, a complete sternum, a scapula, and clavicle are generally concealed beneath the skin; the mouth is small, the tongue fleshy, triangular, covered with papillæ, and but slightly notched at the tip. The eyes, when present, are defended by eyelids, and the bones of the skull are lizard-like in character.

In the genus Acontias, however, the bones of the pelvis and shoulder do not exist, and the eyes are defended only by a single lower eyelid. The form is serpent-like; yet these reptiles do not glide like serpents, but carry their heads and necks erect; they defend themselves boldly, darting with the velocity of a javelin (*ἀκόν*) against their assailant; nevertheless, their habits are gentle, and unless hard pressed they endeavour to escape, and seek safety by concealment. Though reputed venomous, as is their relative the common slow-worm of our island, by the ignorant, they are not at all dangerous; they possess no poison-fangs, and their teeth are small, conical, and blunt. From the extreme rapidity of their movements, they have obtained the name of Javelin or Dart Snakes. A prettily-mottled species, the *Acontias melagris*, is found in southern Africa, and especially at the Cape of Good Hope. The tail is blunt, and the muzzle, which is obtuse, is placed in a single large horny sheath. The food consists of worms and insects, the small and undilatable mouth being unfitted for larger prey. See LIZARDS.

ACORUS is a genus of monocotyledonous plants belonging to the order ARIOIDACEÆ, in the acrid properties of which it participates in a slight degree. *Acorus Calamus* (the sweet flag) is found abundantly in the freshwater marshes of many parts of England. The leaves when bruised are fragrant; for which reason they were formerly employed to strew the floors of rooms or of churches, under the name of rushes. The creeping underground stem (*rhizome*) contains an aromatic, bitter principle, which is useful in cases of dyspepsia, or as an adjunct to tonics or purgatives. The drug is known as

Calamus aromaticus. The essential oil is used by perfumers, and the rhizome itself, or "root," is made by confectioners into a candy.

ACOTYLE'DONES, the name of the first class in Jussieu's natural system of botany. It is derived from the circumstance of all the plants which it comprehends vegetating without the aid of the seed-leaves called *cotyledons*. Such plants are also in all cases destitute of flowers, and are what Linnaeus called CRYPTOGAMIA.

ACOUS'TICS (Greek *ακουω*, I hear) is the science of sound. It therefore embraces the consideration of sound itself, its production and transmission, and also the *transmission* by our ears (as Sedley Taylor has happily called it) of what we shall find to be a merely mechanical impulse, into the sensation of sound.

On the one hand, therefore, we ought to describe those producers of sound which we call musical instruments, and on the other we ought to investigate the physical and psychological action of that wonderful piece of work the human ear. But the plan of this work is to refer the reader, by preference, to articles under separate headings, rather than to group together in one treatise all the information we have space to afford concerning any particular branch of knowledge. The chief musical instruments will therefore be found described in their own articles; the EAR will be treated of in its proper place; and what may be massed together as *auditory apparatus* must be looked for under SIREN, TELEPHONE, MICROPHONE, PHONOGRAPH, AUDIPHONE, &c.

Other branches of the subject we shall be compelled to refer to under other headings in the course of the article; but we have succeeded already in reducing our task to the consideration of those general principles of this fascinating subject which alone the limits of the present article allow.

The vibration of elastic bodies may be seen by the eye, as when we pluck a harp-string; may be felt by the finger, as when we blow through a flute, with our fingers over the finger-holes; but can be *heard* only by the ear, as sound. Sound is a vibratory motion, then, transmitted to us (through some intervening medium) in pulses or waves which originate from the vibrating body, and, beating on the drum of the ear, are felt by us as sound, just as other waves are recognized by the eye as light, and yet others by the skin as heat. Therefore sound follows the usual laws of wave-motions. [See WAVE.] It can be reflected, and who does not know the ECHO? it can be refracted, and even brought to a focus (as by a collodion balloon filled with carbonic acid gas, for instance); it casts a shadow, as the first hill between us and a sounding body will prove, &c. And just as water-waves curl round a rock, so also do sound-waves curl round an obstacle. A most striking instance of this is noticed by Tyndall ("Sound," p. 23) as occurring at Erith when the powder magazine exploded in 1864. The windows in the town, some miles off, were as badly broken on the far as on the near side; but the most curious thing was that the lead window-sashes of Erith Church were all bent inwards, back and front. It must not be supposed that the mass of air between the powder magazine and the church was thrust forward as a whole; this would be entirely to mistake the nature of wave-motion, as a reference to our article WAVE will show. The explosion formed a shell of compressed air round the place of origin, which shell, by the natural elasticity of air, regained its original size, thrusting the air before and behind it into smaller space, and thus creating other shells of compression—these in their turn transmitting the impulse, and the sound thus travelling in all directions. If it be considered closely, it will be perceived without trouble that as the particles of the shell of air which was first compressed swung back by their natural elasticity, they would really swing beyond

their original place, and by so doing would produce the compression of the adjoining shells. Therefore a shell of compression becomes by this rebound a shell of rarefaction, which at the next swing of the particles again becomes a shell of compression, and so on until the original impetus is exhausted. It may assist the imagination of those who have not yet approached the subject to look on these shells of air as similar in relative position to the coats of an onion.

For the propagation of sound there must be an elastic medium of some sort—in the above case, the air. If it be doubted, let Hauksbee's well-known experiment (*Phil. Trans.*, 1705) be repeated. Set going a clockwork bell under the receiver of an air-pump, exhaust the air, and the sound ceases almost entirely; what little remains, perceptible only to the most attentive ear, is due to the transmission of vibration through the cord suspending the bell, or through the apparatus itself. Readmit the air, and the sound recommences instantly. But air is not the only medium for sound; any gas, and, further, any fluid or any elastic solid, serves also to transmit sound. The rapidity of transmission would be at once assumed to vary as the elasticity of the body, and this is found to be the case by experiment. The elasticity of air being increased by heat, we should imagine—and we find this actually the case—that sound travels faster in summer than in winter. Water being more elastic than air, wood more elastic than water, iron more elastic than wood, we should think—and we actually find by experiment—that sound travels faster in water than air, faster still in wood, fastest in iron. But if two substances are equally elastic, the less dense of the two would be the better conductor of sound. What we have to consider is not the density alone nor the elasticity alone, but the relation between the two. "The effect of small density and high elasticity in the same medium" (that is, the most favourable condition possible for wave transmission) "is exemplified in an astonishing manner by the luminiferous ether, which transmits the vibrations of light, not at the rate of so many feet, but at the rate of nearly 200,000 miles in a second of time" (Tyndall, "Sound," p. 26).

The velocity of sound is a problem even now not fully solved, but the main points in which have been settled by the inexhaustible patience of many generations of observers. It is now over two centuries since the Florentine Academy, in 1660, began the long series. A good rough observation may be made by anyone from an echo. Measure the distance to the echoing surface, and then observe with a watch the time between the sounds of smart taps with a stick and the resultant echoes, letting the taps and echoes succeed one another evenly. A mean of several observations will give a velocity of upwards of 1000 feet a second. The same plan has been carried out scientifically, and still more accurate observations have been made by using two stations, and starting sounds from them simultaneously, as in the unequalled series by Moll and Vanbeek, over 9 miles distance, in 1823. The result is that ordinary sounds are found to travel at the rate of 1090 feet a second over a level surface at freezing point, and about $1\frac{1}{2}$ foot quicker for every degree of rise in temperature, so that at ordinary temperatures (say 62°) the velocity is about 1125 feet per second. We limited the observation to sounds of ordinary force, because there is reason to believe that violently excited sound travels faster than sound originated more gently. Thus, as in Captain Parry's experiment in the Arctic regions, the officer's command "Fire!" has been heard considerably *after* the volley which had followed his order. The perfect silence and comparatively even surface allowed the experiment to be made at the distance of $2\frac{1}{2}$ miles. This part of the subject still needs further examination. But whatever may be found to be the truth as to sounds of different intensities,

the fact of the music of a band arriving undisturbed at a distance shows that sounds of all pitches and of all qualities travel at precisely the same speed.

Here we may mention as striking illustrations of the different velocity of sound through different transmitting media the experiments of Gay-Lussac in the Alps, when single taps against the rocks were heard as double ones at some distance off, the sound reaching the observer quicker through the rock than through the air; and still greater differences in time were noted by Biot (in his exceedingly valuable experiments with long empty iron water-mains at Paris) between the tap of a hammer as conveyed along the pipe itself and along the air in the pipe. This may be imitated along an extended iron railing. We may put it in a form easily apprehensible when we say that sound travels through the air at about fifteen times the speed of an express train, and through iron at about 200 times that speed.

The finest experiments as to the velocity of sound in water are due to Messieurs Colladon and Sturm on the Lake of Geneva. They rang a bell under water 9 miles across the lake, and though the musical effect was not perceptible so far, the actual sound was plainly heard. M. Colladon found that he could hear this if his head were under water, but not otherwise; and the happy explanation occurred to him that the sound-wave had behaved as light would do [see REFRACTION], and had been refracted off at an angle approaching the vertical on reaching the surface between the two media, water and air—never, therefore, reaching further across the lake. He plunged a long tube into the water, and had the satisfaction of thus “tapping” the sound-wave, conducting it at his side of the lake into the air, and hearing as distinctly as he had done before under water. This forms a most interesting corroboration of the similarity between sound-waves and other waves. MM. Colladon and Sturm determined the velocity of sound in water as 4708 feet per second (Sir John Herschel in *Encyc. Met. “Sound”*).

We append the velocities of sound through some of the principal media as yet examined:—

	Feet per Second.
Air at “freezing” (32° Fahr.),	1090
Air at “temperate” (62° Fahr.),	1125
Hydrogen,	4164
Carbonic acid gas,	858

Observe the decreased rapidity in the heavy carbonic acid, and the increased rapidity in the light hydrogen gas. This latter is sixteen times lighter than air; the velocity, therefore, is four times as great. The voice of anyone inhaling this gas becomes ridiculously squeaky, but the experiment is rather unhealthy, and had better be taken on trust. We proceed with liquids and solids:—

	Feet per Second.
Water at 59° Fahr.,	4714
Water at 86° Fahr.,	5013
Lead at 68° Fahr.,	4030
Silver,	8553
Copper,	11,666
Iron,	16,822

Wood presents a case of special interest, as the velocity along the fibre is in fir 15,200 feet per second, but across the fibre only 4882 feet; and similar differences exist, in varying amounts, in all woods.

We have spoken hitherto only of absolute observations. It is necessary to add that the velocity of sound in air may be calculated mathematically, and this was first done by the great Newton, who made it 916 feet per second. He conjectured that the error as against observation (which gives 1090 feet, as before said) was caused by his not subtracting the distance between the ultimate particles of air,

assuming that sound would travel over such distances more rapidly than through the particles themselves; but Laplace, observing the heat produced by compression of air (as when tinder or gun-cotton is ignited by pushing a piston down an air-tight cylinder), applied this observation to the compression due to the sound-wave, and on working it out the discrepancy was found to be thus in a much more comprehensible way almost accounted for. Indeed, Newton's suggestion was unverifiable. On calculation, the increased elasticity of the air produced by the heat generated by compression due to sound, gave most of the increased velocity required; and the remainder of the difference was accounted for by the diminished elasticity due to the chilling effect of rarefaction. (Rarefaction, as we have said, is the natural outcome, by rebound, from compression.) For, in a shell of rarefaction, let the particle *a* be swinging away from *b*; then *b* will follow it—

a *b* *c*,

because of the elastic force of *c* behind it, *c* pushing *b* more than the now-distant *a* resists it. But besides the greater distance of *a* lessening its force against *b*, this force is also further reduced because of the sinking of temperature which accompanies rarefaction (just as increase of temperature accompanies condensation); the elasticity of *a* is doubly weakened therefore, and the elasticity of *c*, that is to say, the quickness of its recoil, is made relatively doubly great. The point is so interesting as to be well worth more space than we have been able to afford for its consideration, but with a little attention it becomes quite clear, and as a mathematical demonstration it is absolutely accurate.

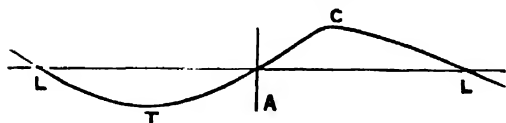
Sound is at once divided by the most thoughtless observer into noise and music; and a very little attention shows us that “generally a noise is accompanied by a rapid alternation of different kinds of sensations of sound. Think, for example, of the rattling of a carriage over granite paving stones, the splashing of a waterfall, the rustling of leaves in a wood. On the other hand, a musical tone strikes the ear as a perfectly undisturbed uniform sound, which remains unaltered so long as it exists, and it presents no alternation of various kinds of constituents. But we can compound noises out of musical tones, as by striking all the keys of a pianoforte at once. This shows us that musical tones are the simpler and more regular elements of the sensations of hearing, and that we have consequently first to study the laws and peculiarities of this class of sensations.” (Helmholtz, “Sensations of Tone,” trans. A. J. Ellis, 1875, p. 12.)

“The sensation of a musical tone is due to a rapid periodic motion of the sonorous body; the sensation of a noise to non-periodic motions.” (Helmholtz.)

These periodic motions excite waves, and although we refer the reader to the article WAVE for a more complete treatment of this notion of undulatory motion, we must add a few words here to make it sufficiently clear for our purpose. If an elastic line, such as a thick piece of india-rubber, 8 or 12 feet long, be fastened at one end and gently stretched by the hand at the other, and if now the hand excites a wave in the line, the wave will run along it, strike at the end, reverse itself, and run back along the line to the hand. It is evident that no part of the line has moved backwards or forwards, but that the wave was caused by particles of the line vibrating to and fro across the passage of the wave. So also while waves of water are advancing to the shore, the up-and-down motion of a ship will show that the water itself is not advancing, but its particles are vibrating transversely. Only the shoremost wave, being unsupported, falls upon the beach; the remaining water as a mass remains practically stationary. So also if a tube be held in front of a candle, and two pieces

of wood be clapped smartly together at the further end, the candle will be blown out; but the fact that this is due to a wave only is clearly shown by filling the tube with thick smoke, when the same result will follow, but without the smoke being expelled from the tube—the wave passes through it without disturbing it.

If we draw a sketch of a water-wave we see that *L. I.* is the *length* of the wave, *T* is its trough, *C* its crest, and *A*, which measures from *T* to *C*, is its *amplitude*. The *form* of the wave is the mode (that is, the curve) in which it



moves, which is manifestly the same mode in which a drop swings from the level of *L* down as low as *T*, then right up as high as *C*, and then down as far as *L* again. These three elements—length, amplitude, and form—determine exactly the figure of a wave.

Just so is it with a sound-wave, only here the amplitude is in the direction of the wave itself, instead of being transverse to it as in the water-wave. This may perhaps be better grasped by considering a field of corn swaying under a puff of wind. [See Plate, ACOUSTICS.] If we suppose the action of the wind to have reached as far as the right hand of the figure, then the stalks a little towards the left will but have just begun to bend, those further back will be bent to their utmost, as at *A*, while *B C D* are rising again, now the puff has passed; *E* and *F* have almost risen, and *G* has quite risen, to the perpendicular; *H* and *I* have swung backwards beyond the perpendicular, and stalks further to the left are still more bent backwards, till at *J* we find a stalk which has recoiled just as far backwards as *A* has swung forwards. *K L M N* are recovering themselves from their backward swing, and as we look to the left we find the stalks still more nearly approaching the perpendicular, as *O P*; and at *Q* we have reached the perpendicular again. That is to say, the stalk *Q* was once bent as *B* and *S*, still further bent under the puff of wind till it was like *A*, then it recovered itself, till it resembled *E F G*, but having begun to vibrate it passed on to the position *H I* now occupy, and even down to that of *J*, whence it gradually swung up again to *Q* as at first—not, of course, to stop here, but to pass beyond and repeat the vibration again and again until the original force be spent.

If we neglect the downward bend of the corn-stalks, and consider only their forward and backward movements, we have here a very fair picture of the alternate condensation and rarefaction of the particles of the air under the action of sound. The length of our wave is from *Q* to the extreme right of the figure; its amplitude is the distance between the ears *A* and *J* if they were placed root to root, for that is the extreme distance each ear swings, and its form is a perfectly regular one, each part of the swing being performed at exactly the same rate as each other part. It is quite evident that if the length of the wave remains the same, the extent of swing (amplitude) may vary exceedingly; for instance, a wave of greater amplitude, but otherwise similar, would have wider rarefactions and closer condensations. It is also clear that the mode or form may vary; for instead of an even swing as here, the particles may swing rapidly forward and slowly backward, &c. These differences do not affect the length of the wave, which is measured from any point (as the centre of a condensation, *Q*) to any other exactly similar point in the wave, and includes one complete condensation and one complete rarefaction.

Now, musical tones are distinguished by their *pitch*,

their *force*, and their *quality*; and we find by observation that the *pitch* of the sound is due to the *length* of the wave, the *force* of the sound is due to its *amplitude*, and the *quality* of the sound is due to its *form of vibration*.

That the force of a loud sound is due to the amount of swing of the vibrating body is evident. Strike a bell harder, that is, set it into more violent vibration, and you get a louder tone, &c. Also the pitch of a tone can be shown to depend on the length of the wave by the *SIREN* (to the article on which the reader is referred for greater details) and similar instruments. Any sort of disturbance of the air, whether by puffs of wind, the clicking noise of a quill against a toothed wheel, the dripping of water, the vibration of a string, &c., will make a musical sound of like pitch (though of very various quality) if the vibrations are of like number; 120 puffs a second give a note of the same pitch as 120 clicks a second or 120 splashes a second, and 150 vibrations a second will give a note of higher pitch—that is, of shorter wave—than 120. For since all sound, whether high or low, travels at the same rate (as we instanced in the case of a full band), it is evident the sounds due to quicker vibrations must be made by shorter waves—the lower sound of 120 pulses a second travels as fast through the air as the higher one of 150; therefore it must have longer and slower waves, since it only takes 120 of them to cover the same space and time as 150 of the others.

The siren gives us the means of making puffs of wind rapidly; and we find that if we increase the rapidity of the puffs the sound rises, becomes more acute. If we double the rapidity, we get the effect of what we call an *octave*. If 120 puffs a second give us a deep tone, 240 will give us the octave above that tone. Further experiments will show us that 180 puffs a second give us a note a *Fifth* above that produced by 120. So also 160 puffs a second give us the *Fourth* above the note produced by 120. Thus we get the vibration ratios of the principal musical intervals as follows:—

1 : 2—the octave.	2 : 3—the fifth.
3 : 4—the fourth.	4 : 5—the major third.
5 : 6—the minor third.	8 : 9—the major tone.
9 : 10—the minor tone.	15 : 16—the semitone.

If we raise by an octave the lower tone of the two forming an interval, the interval becomes *inverted*; thus a *Fourth* is an inverted *Fifth*, a *Sixth* an inverted *Third*, &c. We raise a note an octave by doubling its vibration-number; so from 2 : 3 (the *Fifth*) we get 3 : 4 (the *Fourth*); from 4 : 5 (the major *Third*) we get 5 : 8 (the minor *Third*); and from 5 : 6 (the minor *Third*) we get 6 : 10 (the major *Sixth*). The latter ratio is of course reduced to 3 : 5. It is very striking to observe that all the consonant intervals, octave, *Fourth* and *Fifth*, *Thirds* and *Sixths*, are expressed by the ratios of the numbers 1, 2, 3, 4, 5; and the Greeks, who had already discovered this, asserted that this was the secret of consonance. The ear, said they, appreciates and loves the simple ratio of the concord 1 : 2, dislikes the complex ratio of the discord 15 : 16. We shall find, however, that the causes of consonance lie much deeper than this.

But when once the pitch—that is, the number of vibrations per second required to produce it—of any one note is fixed, the pitch of all other notes follows rigorously from it. If we take $c = 528$, then the lowest note of the pianoforte (*a a a*) has 27½ vibrations per second, and the highest note (*a''''*) has 8520 per second. The *a a a* is too low to be heard by the ear, we have reason to believe—the brain perceives it rather by inference; but the ear can distinguish tones of very much greater acuteness than the *a''''*. The writer of this article, in the course of experiments made with the distinguished acoustician, Mr. A. J. Ellis, F.R.S.,

heard tones of excessive shrillness, certainly not less than 40,000 vibrations a second, quite distinctly. But the practical limits of the human ear may be taken as extending from the perception of 40 to that of 4000 vibrations per second. Or to put it in another way, the ear can hear over a range of 11 octaves, but hears well over a range of 7 octaves only. (The eye, be it remarked, sees but little beyond an octave, but it deals with infinitely more rapid vibrations.) For details as to the pitches in use, history of pitch, &c., see *PITCH*.

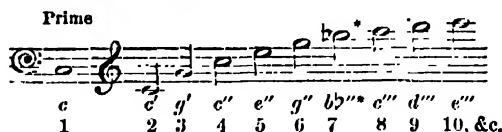
We have now considered the force and the pitch of sounds; it remains to investigate their *quality*.

No one can fail to perceive that if a violin and a trumpet play the same note with the same force they differ in *quality*. Even two different performers on the same instrument produce sounds of very varying quality. The exquisitely even full tone of a Joachim, and the ear-torturing scrape of the beginner, can be heard from the very same fiddle. We have said that this variation of quality is due to variation in the mode of vibration; and possibly this needs elucidation. We would ask the reader to contrast the motion of a pile-driving hammer, slowly raised and suddenly falling once a second, with the evenly swinging seconds-pendulum; they differ entirely in mode, and yet each vibration is equal in length. Or the alternate drag and slip of the string under the fiddle-bow, how different to the motion of an elastic ball, with its sudden reversal of direction, its diminishing upward flight, and its accelerating downward fall. Now, we shall show elsewhere that every different quality of tone requires a different form of vibration, yet that more than one form of vibration may produce a given quality of tone. [See *WAVE*.]

Let the reader gently press and hold down middle *c'* on the pianoforte, and then strike the octave below it once, sharply; he will hear the first note distinctly sounding after the second has been allowed to cease. The same effect will be found when bass *c* is struck with treble *g'* held down, and with treble *c''*, and even with the *e''* above that. That is to say, the bass *c* causes these various notes to sound, although they have not been struck, by sympathy or *RESONANCE*, in a manner which we will more fully explain in the article of that name, showing in the course of that article that resonance only occurs when vibrations of the same period (or length, or vibration-number, or pitch, for all these terms are here synonymous) are already present in the surrounding air. The ear being thus trained will now be able unassisted to perceive these upper tones in any tolerably deep tone, not only on the pianoforte, but on any musical instrument whatever; and if assisted by certain hollow spheres of various sizes (carefully adjusted to reinforce certain special tones), which are the invention of the distinguished Helmholtz, and are called *RESONATORS*, the ear readily detects upper tones in almost every musical sound. We will call such musical sounds *compound tones*; the lowest tone, which gives the pitch to the whole, we shall call the *fundamental tone* or *prime*, and the others we shall call the *upper partial tones*. The prime is therefore nothing more than the first partial tone.

These partial tones follow one another in a certain absolute order, never varied; but the whole series need not be gone through. They occur as follows:—The *first partial* of a compound tone is the prime, as *c*. The *second partial* is the octave to the prime, as *c'*, with twice as many vibrations. The *third partial* is a Fifth above the second, with $\frac{3}{2}$ as many vibrations; that is, with three times as many vibrations as *c*, and this will be *g'*. The *fourth partial* will be a Fourth above this *g'*, and will be the upper *c''*, with four times as many vibrations as the prime *c*. The *fifth partial* (*e''*) will have five times, the *sixth partial* (*f''*) six times as many vibrations per second as the prime, and so on, each higher partial as a general

rule becoming fainter and fainter. We may represent the theoretical series of partials in musical notes thus—



Now, if any of these partials occur in a compound tone, they occur always in this order; if any are missed from the series, the gap is left, and the next partial is the next higher of the series. Thus the clarinet is found to have the odd partials, 1 (prime), 3, 5, &c., and none of the even ones, 2, 4, &c. The compound tone of *c* on the clarinet is thus made up of *c*, *g'*, *e''*, &c. The partials *c'*, *c''*, &c., are left out, and nothing takes their places. [See *CLARINET*.] Further, in the smoothest qualities of tone these partials decrease in force as they rise; but the trumpet derives its "clang" from the special force of certain upper partials. [See *TRUMPET*.] And, indeed, it depends on the presence or absence of these several partials, the number of them which are audible, and their relative force, what will be the quality of the *compound tone* they unite to produce. We get about 6 partials (the prime and the five next succeeding) in the tones of a pianoforte, 6 to 8 in the tones of a fiddle, 5 or 6 in the tones of the human voice. It is manifest, therefore, that if the several separate partials corresponding to that quality were produced, each with its appropriate force, we could construct any quality of tone desired; and since tuning-forks can be so treated as to give almost pure tones without partials, Helmholtz used them for this purpose, and from a suitable series of them, arranged with means of varying the power of each fork, he built up excellent imitations of the human voice, the French horn, clarinet, &c.

We refer the reader to our article *VOWEL TONES* for a further account of Helmholtz's remarkable discoveries concerning the human voice. Under the article *EAR* we shall return to the analysis of tones by that most wonderful of all the sense-organs.

The mode of vibration of *BELLS* we shall treat of under that article, and so of other musical instruments, each in its own place. The modes of vibration of stretched strings will be found explained under *STRINGED INSTRUMENTS*, and the use of musical pipes under *ORGAN-PIPES*. *REED INSTRUMENTS* will contain the musical theory of free and of beating reeds, whilst that of reeds will be dealt with under *TUNING FORK*, since such a fork is but a bent rod of steel, to which a handle is fitted (see Plate, fig. 2; figs. 3, 4, and 5 will be described under *WAVE*). The vibration of plates may be made visible by sand strewn upon them, as described in our article *VIBRATION*; and the vibrations of stretched membranes vibrating to tones with which they are in harmony will be dealt with under *RESONANCE*.

A fact which always strikes one with astonishment, is the actual creation of a fresh musical tone by the action of two loud tones upon one another. Such a "musical ghost" is called a *COMBINATIONAL TONE*, and demands an article to itself.

Finally, we refer the reader to the articles *CONSONANCE* AND *DISSONANCE* AND *INTERFERENCE OF SOUND* for an account of Helmholtz's researches in these departments, including the theory of *beats* and the philosophical basis of *harmony*. The practical outcome of acoustics, the creation of the material of music, will be dealt with under *SCALE*.

The best works on acoustics are Sir John Herschel's excellent treatise on "Sound" in the *Encyclopædia Metropolitana*, Helmholtz's "Sensations of Tone," a magnificent work which has revolutionized musical acoustics, Sedley Taylor's "Sound and Music," Tyndall's "Sound," and (for the mathematical part) Everett's "Vibrations," 1882.

ACQUAPENDENTE, a town in Italy, near the border of Tuscany. It is built on a precipitous mass of rock, over which several pretty cascades, from which the town derives its name, fall into the ravine below. It was but an insignificant place until 1650, when Pope Innocent X., having razed to the ground the neighbouring town of Castro, where a bishop had been murdered, transferred the see to Acquapendente. This town is ill-built, dull, and dirty. It is 70 miles N.N.W. of Rome, and has 5000 inhabitants.

AC'QUI, a town of Northern Italy, in the province of Alessandria, on the river Bormida. It has a fine cathedral of the twelfth century, with a handsome façade, several other churches, a college, town hall, and some other interesting buildings, and is the see of a bishop. Good wine is produced, and silk manufacture is largely carried on. The population is 12,000. The old walls were pulled down after the peace of 1815, but the castle still stands on a hill outside the town. Acqui is much frequented by invalids from Lombardy and Genoa for its hot sulphur springs. The "fango," or mud formed by the sediment of the water, is applied in many cases of local complaints or old wounds, and is considered very efficacious. The town derives its name from its springs, which were known to the Romans by the name of *Aque Statiellæ*, Statielli being the name of a tribe of Ligurians who inhabited this region.

ACQUITTAL (from the French *acquitter*, to free or discharge) signifies a deliverance and setting free of a person from a charge of guilt; thus a man who, upon his trial for a criminal offence, is discharged by the jury, is said to be acquitted. The acquittal by the jury has, however, no legal force until judgment has been given upon the verdict by the court in which the proceedings are instituted.

After judgment of acquittal, if the party be indicted a second time for the same offence, he may plead his former acquittal as a bar or a complete answer to the second charge; and upon such former acquittal being admitted or proved, the person indicted is entitled to be discharged.

ACQUITTAANCE is a discharge in writing of a debt or sum of money due. A general receipt or acquittance in full of all demands will discharge all debts, except such as are secured by what are termed *specialties*, namely, bonds and instruments under seal, which are considered by the law as of too great force to be discharged by a verbal concord and agreement, or any less formal and solemn acquittance than a deed.

Courts of equity, and even courts of law, will in some cases order accounts to be gone into anew, notwithstanding the production of a general acquittance or receipt in full of all demands, upon proof that such acquittance was obtained by fraud or given under a mistake, and that the debt or other demand has not been in fact satisfied.

ACRE, a measure of land, of different size in the different parts of the United Kingdom. When mentioned generally, the statute or English acre is to be understood, as that is always used in official measurements, and has thus practically superseded the acreages which were formerly in use in Scotland and Ireland. A square whose side is 22 yards long is the tenth part of an acre, which therefore contains $22 \times 22 \times 10$, or 4840 square yards. The chain with which land is measured is 22 yards long, so that 10 square chains are 1 acre. This measure is divided into 4 rods, each rod into 40 perches, so that each perch contains $30\frac{1}{2}$ square yards, thus:—

Acre.	Rod.	Perch.	Square yards.	Side of equivalent square, in yards.
1	= 4	160	4840	69.5701
	1	= 40	1210	34.7851
		1	= $30\frac{1}{2}$	5.5

The Irish acre is larger than the English—121 Irish acres being very nearly equivalent to 196 English. The Scottish acre is also larger than the English, 48 Scottish acres being equal to 61 English. The English statute acre is used in America. The arpent, in the old French system of measures, corresponded very nearly to the English acre, but is now entirely superseded by the hectare (100 acres), which is 2.47 English acres.

A'CRE, ST. JEAN D', a town on the coast of Syria. It is built on a small promontory, which, with Mount Carmel lying to the south, forms a circular bay. It is believed to be the *Accho* of Scripture (Judges i. 31), afterwards changed by Ptolemy Soter, king of Egypt, to Ptolemais. Later on the Romans obtained possession of it, and Strabo mentions it as an important place. During the middle ages Acre passed into the hands of the Saracens, from whom it was taken in 1191 by the crusaders under Philip Augustus of France and Richard I. of England, and was then for some time held by the Knights of Malta. It was finally lost to the crusaders in 1291, when it was retaken by the Saracens, but was seized by the Turks in 1517. One of the more remarkable of its numerous sieges was in 1799, when Bonaparte invested it for more than sixty days, and made an unsuccessful attempt to take it by storm. The defence was greatly aided by Sir Sidney Smith, under whom was a body of British sailors and marines. On the revolt of Mehmet Ali, pacha of Egypt, Acre was taken, in 1832, by his son Ibrahim Pacha. In 1840 it was bombarded by the English and Austrian fleets, and restored to the Turks. The combined fleet was commanded by Admiral Sir Robert Stopford, under whom Sir Charles Napier acted as commodore of the English squadron.

Acre was in a very ruinous condition in the middle of the seventeenth century, but it has since been improved, and now contains about 15,000 inhabitants. The streets are narrow, and the houses, which are of stone, have flat roofs. The port, although one of the best along this coast, is small and not deep, and vessels therefore generally anchor at Caiffa, on the south side of the bay. The imports are cloth, lead, tin, &c.; and the exports cotton and corn.

ACROBAT, a name derived from the Greek (*ἀκροβαίω*—*akron*, extremity; and *baio*, I go to walk on tiptoe), and given to athletes who perform feats of walking, vaulting, &c., on a slack or tight rope. Evidence exists that there were very skilful performers of this kind in ancient times among the Greeks and Romans. The name is now extended to performances on the trapeze, and the extraordinary skill and daring displayed by modern acrobats attract considerable attention in most of the countries of Europe, and in the United States.

ACROCAR'POUS MOSSES (*ἄκρος*, at the top; *καρπός*, fruit) are those in which the "fruit" is at the end of the branches, as contrasted with *pleurocarpous mosses*, in which the "fruit" springs from the sides of the branches.

ACROCHOR'DUS, a genus of serpents discovered in Java by the Swedish naturalist Hornstedt. It belongs to the sub-order Aglyphodontia.

This genus is remarkable for the warty appearance of the skin, caused by the arrangement of the scales, which are minute, separate from one another, and each marked with three small ridges. These, when the skin is inflated, assume the appearance of granulations. The head is flat, and covered with small scales; the mouth is provided with a double row of small sharp teeth; there are no poison fangs. The throat is capable of enormous dilatation. The tongue is short and thick, the mouth contracted, and the under jaw shorter and broader than the upper. The *Acrochordus jaranicus* is not a poisonous serpent,

though some have supposed it to be so. It averages from 6 to 10 feet in length, and is of a peculiar form, the body increasing in thickness from the neck to the base of the tail; the tail, on the contrary, is not only short, but abruptly slender. A female caught in a plantation of pepper trees, and opened by Hornstedt, was found to contain five young ones, perfectly formed. The native of China who accompanied Hornstedt cooked and ate the flesh of the specimen alluded to, and reported it to be most delicious. That a non-venomous serpent should be viviparous is not less extraordinary than that a serpent should be frugivorous. See SERPENTS.

ACROCOMIA (*ἀκρός*, at the top; *κῆρυξ*, hair), a genus of PALMS, natives of South America and the West Indies. The stem is often 50 feet high, and is clothed, like the leaf-stalks and spathes, with long spines. The name is derived from the mass of large feather-shaped leaves gracefully drooping from the summit of the stem. The spadix, bearing the small flowers, is simply branched. *Acrocomia sclerocarpa* is the "great macaw-tree" of Brazil and the West Indies. It is 20 to 30 feet high, with leaves 10 to 15 feet long. The nut, which is capable of a very high polish, is the centre of a roundish olive-coloured fruit. The thick golden oil extracted from the kernel is sold under the name of "palm-oil." It is used in making toilet soaps, and also as an emollient in affections of the joints.

ACROGENS (*ἀκρος*, at the top; root *γεν*-, produced) is a name in botany used by Lindley to include all flowerless plants, as contrasted with flowering plants which were divided into Endogens and Exogens. The name, which was formed to imply that the growth went on at the summit of the plant, was limited by Brougniart to those cryptogams which have a distinct stem and leaves, viz., Musci (mosses), Hepaticæ, Filices (ferns), Marsileæ, Lycopodiæ (club-mosses), and Equisetæ (horse-tails). Later observations have shown that the names Acrogens, Endogens, and Exogens, used as names in the above sense, are not strictly accurate.

ACROPOLIS, a Greek compound word signifying "the highest point of a city." It was used to denote some hill, rock, or natural elevation, such as we find forming part of the sites of many ancient cities in Greece. The term Acropolis is now most commonly applied to the rocky eminence of Athens, on which the remains of the Parthenon stand, but this is only a limited use of the word. Corinth had an acropolis called Acro-Corinthus. An eminence close upon the modern Argos, in the Peloponnesus, was the acropolis of the ancient Argos. The acropolis of Messene, in the Morea, situated on Mount Ithome, is another remarkable specimen of those natural bulwarks which were once fortified according to the principles of Greek military science.

ACROS'TIC, a Greek term, signifies the beginning of a line or verse. An acrostic is a number of verses so contrived that the first letters of each, being read in the order in which they stand, form some name or other word. This species of writing was extremely fashionable among the early French poets, from the age of Francis I. down to that of Louis XIV. Some of our English poets of considerable eminence also used formerly to amuse themselves in the same way. Sir John Davis wrote twenty-six hymns to Astræa, each of which is an acrostic on the words *Elizabetha Regina*. Dryden, in his "Mac Flecknoe" (1682), in ridicule of the acrostic, introduces the king of the realms of Nonsense as saying to Shadwell his son:—

"Leave writing plays, and choose for thy command
Some peaceful province in Acrostic-land."

Addison, in the *Spectator*, No. 60, also speaks contemptuously of the inventor of the acrostic. Against these

expressions of opinion may be set the facts that this mode of composition is of great antiquity, and that there are twelve poems of this character in the Old Testament. Of the latter the best known example is the 119th Psalm, of which, in the original, the first eight verses begin with the first letter of the Hebrew alphabet, the second section of verses with the second letter, and so on to the end of the alphabet. The first four chapters of the Lamentations of Jeremiah are also alphabetical acrostics—the third being most elaborate in its construction.

Acrostics, single and double, and combinations of the enigma and acrostic, are freely introduced in the magazine literature of the day, and the solution of these puzzles affords a harmless amusement.

ACT. This word is a form of the Latin *actum*, from the verb *agere*, which is used generally to express the doing of any act. The Latin word *actio*, from which our word action is derived, had, among other significations, various legal meanings. Of these meanings one of the most common was the right by which a man pursued a claim in a court of justice, who was accordingly in such case called the *actor*. In this sense we have in our language the expression action at law. The word act, a thing done, is sometimes used to express an act or proceeding of a public nature, of which sense the most signal instance among us is the term Act of Parliament, which means an act in which the three component parts of the sovereign power in this country, King, Lords, and Commons, unite; in other words, a law properly so called. The word act is also sometimes applied to denote the record of the act; and by the expression Act of Parliament, is now generally understood the record of an Act of Parliament, or the written record of a law. This meaning of the word act or acts is derived from the Romans, among whom *acta* signified the records of proceedings, and especially public registers and protocols in which the acts and decrees of the public bodies or functionaries were entered, as *Acta Principum*, *Senatus*, *Magistratum*. The *Acta Publica* or *Diurna*, or *Acta Urbis*, was a kind of Roman newspaper. See *ACTA DIURNA*.

ACT (in the drama), that portion of a play which is separated from the rest by an interval, during which the stage is left empty. Among the Greeks the stage was never left empty from the beginning to the end of the performance; when the other actors retired, those forming the chorus still remained, and continued the business of the play by the lyrical compositions, which, from being at first essential parts of the action of the drama, became later mere choral odes of a general character (see GREEK DRAMA). This innovation led in the "New Comedy" of Menander, by the omission of the choral interludes, to the division of a play into acts; and the number five was fixed upon as the most suitable. The rules of the ancient drama, however, were strictly observed; and the duration of the action of a play was confined as nearly as possible to the time employed in its representation. Of the Roman dramatists Terence, whose plays are almost an exact imitation of Menander's comedies, observed with the utmost strictness the "unity of time;" while Plautus, infusing more of the spirit of the old Roman *Atellanæ Fabulæ* into his comedies, constantly violates it. By modern dramatists, however, this practice of dividing a play into acts has generally been taken advantage of to extend the time of the story greatly beyond the space to which it was necessary to confine it on the Greek stage. The division into acts is really that distinction of the modern drama which more than anything else gives to it its peculiar character. Dr. Johnson has observed of modern plays, "The time required by the fable elapses, for the most part, between the acts; for of so much of the action as is represented, the real and poetical duration

is the same." Although the French dramatic writers have adhered to the principle of leaving the stage empty only at the end of an act, many of the English dramatists have followed a different practice. In Shakspeare particularly every successive scene uniformly presents a new set of characters, and most commonly a change of place also. He rarely interrupts the action, however, for any considerable space, except during the interval between two acts; but here he does not hesitate to pass over any length of time he may find convenient. The old English *Mysteries* and *Moralities*, the first produce of our national dramatic genius, were long destitute of any division either into scenes or acts.

ACTA DIURNA ("Proceedings of the Day") was the title of a gazette, to use the nearest modern term, drawn up and published daily at Rome both under the republic and the empire. It appears to have contained an abstract of the proceedings of the public assemblies, of the law courts, of the punishment of offenders, an account of any public buildings or other works in progress, together with a list of births, deaths, marriages, divorces, and the like. Until the first consulship of Julius Cæsar the proceedings of the senate were not published, but Cæsar made provision for giving the same publicity to all the proceedings of the senate which already existed for the popular assemblies. (Suetonius, "Life of Julius Cæsar," c. 20.) Under Augustus this rule was repealed. The Acta of the Senate, though still registered, were no longer published; and as all the popular assemblies were now deprived of real authority, the Acta Diurna henceforward can have had little political interest. Even in its best days this state gazette was, no doubt, an extremely meagre document, and yet the Acta Diurna were often consulted and appealed to by the historians of after times as documents of the highest authority. (Lipsius, in his "Excursus on the Annals of Tacitus," lib. v. c. 4.)

ACTÆA. Under the name of ἀκτῆ the Greeks described a medicinal plant which is considered to be the elder-tree. Linnæus applied the name to a genus of perennial herbaceous plants found in various parts of Europe, the north of Asia, and America, belonging to the order Ranunculaceæ, and only in a slight degree resembling the species intended by classical authors.

One species, *Actæa spicata*, a common European plant, is found occasionally in the north of York-shire among bushes; it is popularly called Black Baneberry, and also Herb Christopher. It has purplish-black juicy fruits, which would be dangerous, from their tempting appearance, if the fetid odour of the leaves did not prevent their being touched.

ACTÆON, son of Ari-tæus and grandson of Cadmus. The centaur Cheiron trained him as a hunter. One day while hunting he came upon Artemis (Diana) and her nymphs bathing. He was imprudent enough to stop and gaze, whereon the angry goddess, who discovered him, changed him into a stag, in which form he was torn to pieces by his own pack of 50 dogs. The legend is thus told by Ovid in the "Metamorphoses", but there are other accounts of the manner in which he offended the goddess.

ACTA SANCTORUM. See *HOLLANDUS*.

ACTINIA. See *ANEMONE*, *SEA*.

ACTINISM (Gr. ἀκτῖς, a ray), in physics, the radiation of light or heat. The term is therefore applied to that branch of natural philosophy which treats of the radiation of heat or light. See *ACTINOMETER*.

ACTINOMETER (from ἀκτῖς, a sunbeam; and μέτρον, a measure) is an instrument employed for the purpose of ascertaining the intensity of heat in the direct rays of the sun. It consists of a hollow cylinder of glass, which is united at one end to a thermometer tube; the cylinder is filled with ammoniac sulphate of copper (a deep blue

fluid), and is inclosed in a box which is blackened on three sides interiorly, with a thick glass in front. The instrument was invented by Sir John Herschel in 1825.

In making the observations the instrument is disposed so that the sun may shine on its glass face, when the liquid will mount rapidly in the thermometer tube; at the end of three or four minutes the extremity of the liquid is brought to the zero of the scale by turning a screw, which increases or diminishes the capacity of the cylinder; after which, at the end of one minute, two minutes, and three minutes, the observer registers the number of the graduation corresponding to the top of the column of fluid as it continues to rise. The instrument being then covered with a screen three observations are made as before, at intervals of one minute, as the liquid descends in the tube. It is again placed so that the sun may shine upon it, and afterwards in the shade, when two other sets of observations are made, and so on.

A mean of the two differences between the readings at two nearest observations while the sun shone on the instrument, added to the difference between the readings at the intermediate observations while the instrument was in the shade, is taken as a measure of the intensity of the sun's radiation at the middle time between the first and third observations; and a mean of such results for all the triplets of observations is considered as the general mean.

The actinometer is highly useful in determining the quantity of solar heat which is absorbed in passing through different strata of the atmosphere, for which purpose the observations must be made at stations differently elevated above the general surface of the earth or sea. It may also be employed to determine the diminution of heat which takes place during eclipses of the sun.

Pouillet has invented an instrument for the same purposes as Herschel's, which he calls a pyrheliometer. From the observations made with both instruments it has been calculated that, of the heat which comes to the earth from the sun, one-half is absorbed by the atmosphere, the other half reaching the ground. "Taking this into account, and imagining for a moment that the earth has no atmosphere, it is calculated that the amount of solar heat received by the earth in one year would liquefy a layer of ice, 100 feet thick, covering the whole surface of the earth. If we bear in mind that the solar heat which reaches the earth in any time is only $\frac{1}{1000000000}$ of the heat which leaves the sun, we may obtain some idea of the enormous heating power of the radiation from our luminary."—*Balfour Stewart*.

ACTINOPHYRS, or Sun Animalcule, is placed in the order *HELIOZOA*, of the class *RHIZOPODA*. It is merely a round mass of jelly-like substance, and is entirely destitute of organs. As in the *AMEBA*, the granular body substance becomes clear towards the exterior. From this clear layer fine threads are put out in all directions, gradually getting longer, with some granular matter passing into them from the centre. These interlace and branch; and as the actinophrys has neither mouth nor stomach, food is taken in by means of these *pseudopodia* (false feet), which retract over small food-particles and press them into the body, the surface of which also retracts, forming a cavity into which the food-particles sink when the body-wall again unites, leaving the food to be assimilated. The animal afterwards casts out, by a reverse process, the particles not assimilated.

ACTINOZOA is a class of animals belonging to the sub-kingdom *CELENTERATA*. In the class are included anemones, corals, dead-men's fingers, and sea-pens. These more or less agree in certain particulars. They are animals of very simple structure, living in water. Like other coelenterates the substance of the body is formed of an outer and an inner layer; there is a distinct mouth, through which the food passes into a digestive cavity or "stomach;" from the stomach the digested food passes

ACTINOPTERA

(ALEYONARIA)

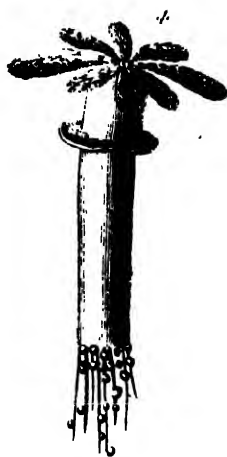
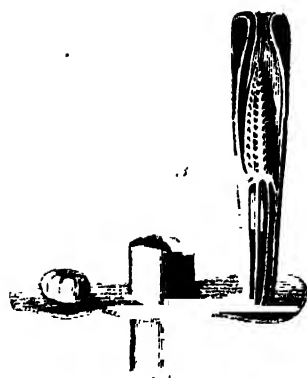
PLATE 2.



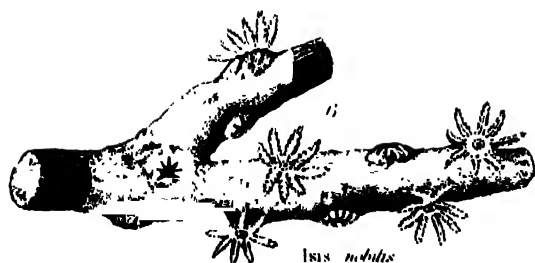
Comulania (rudosa) rosea



2. Comul. (rudosa) rosea



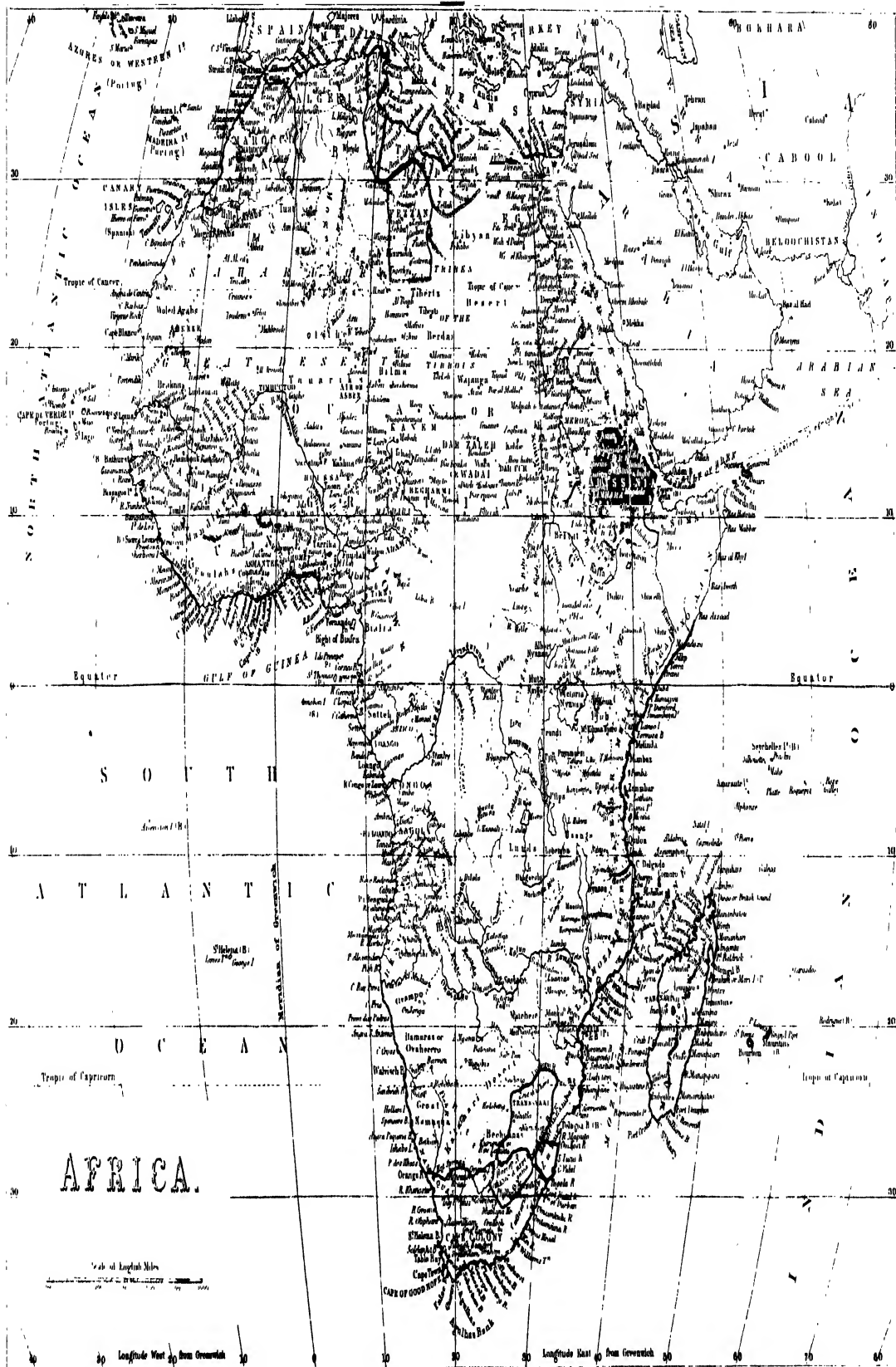
Renilla (brevicauda)



Isis nobilis



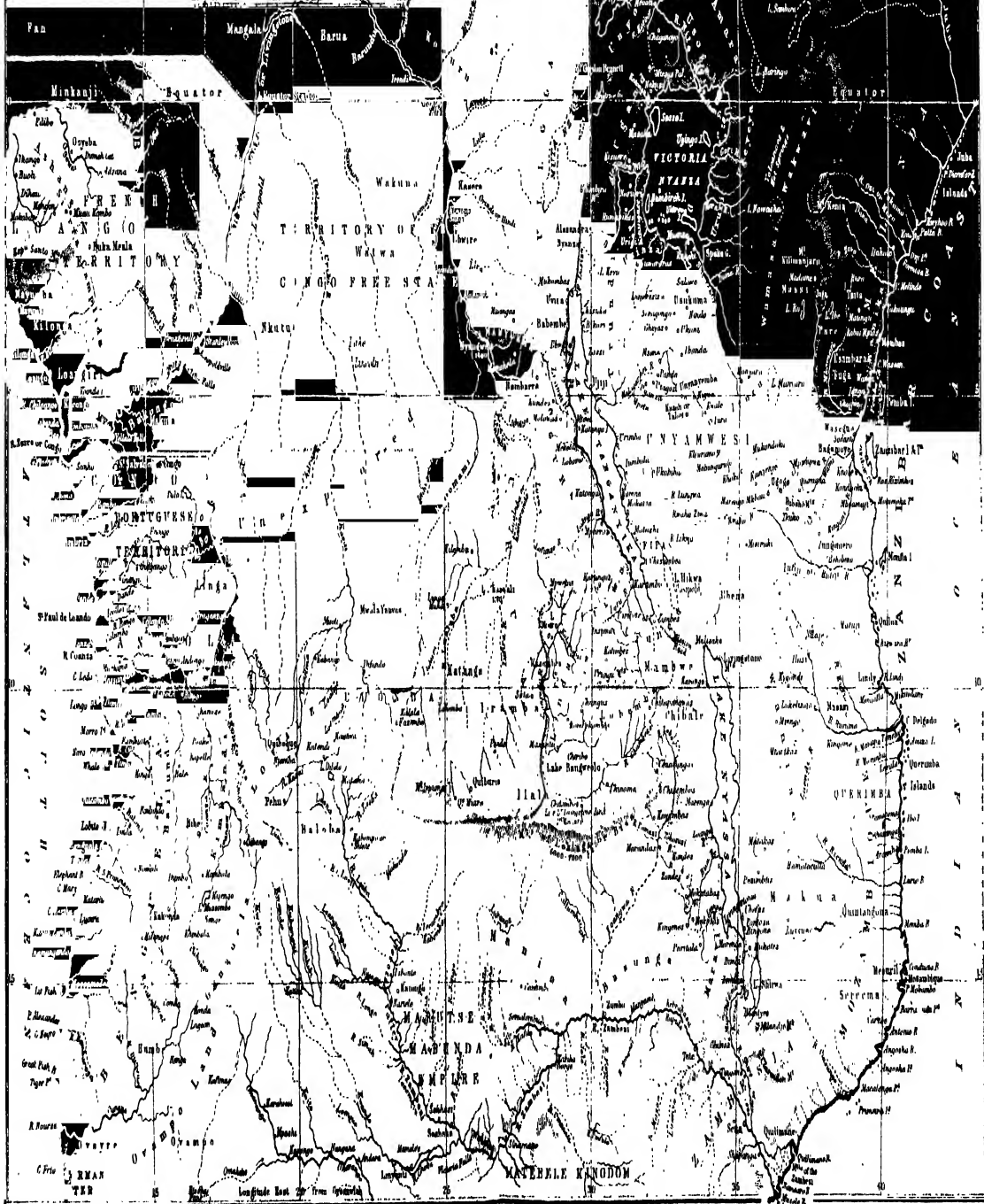
Gorgonia patula

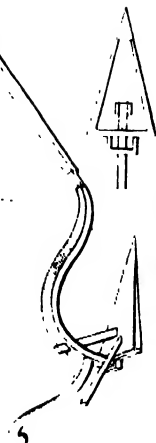


CENTRAL AFRICA

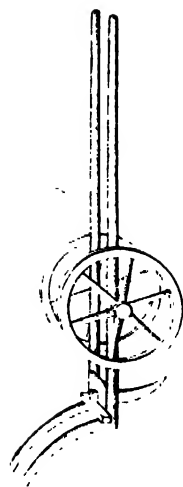
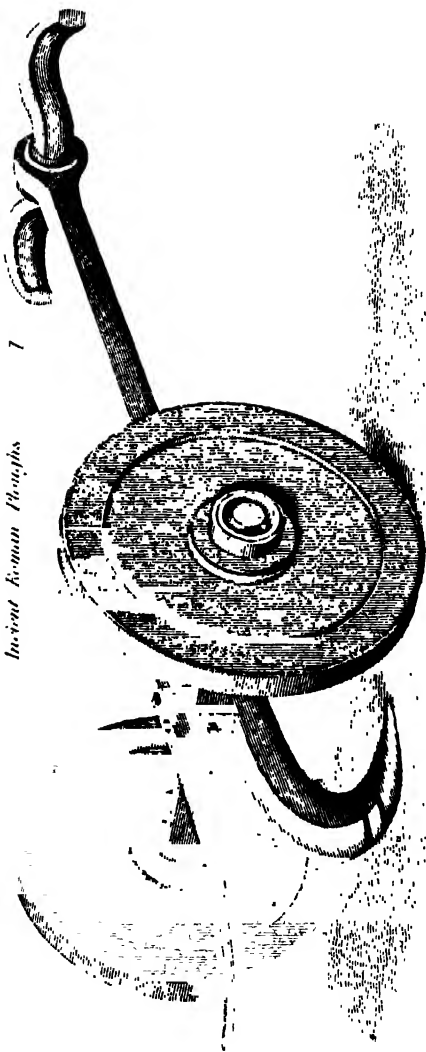
SHOWING THE MOST RECENT EXPLORATIONS
of Livingstone, Burton, Speke & Grant, Baker, Stanley, Cameron, Thomson &c.

Scale of English Miles

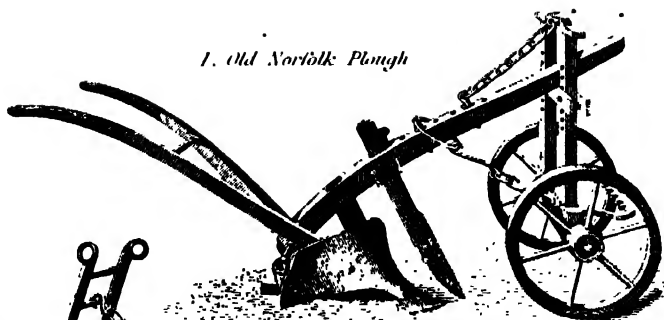




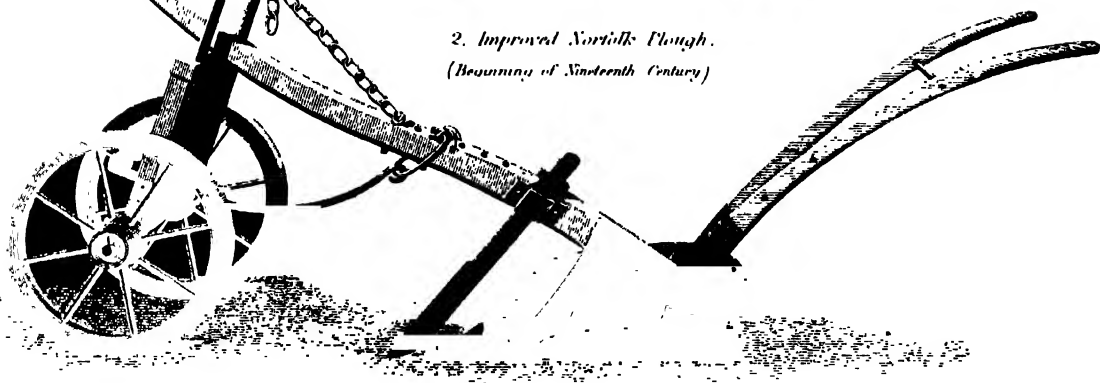
Ancient Roman Ploughs



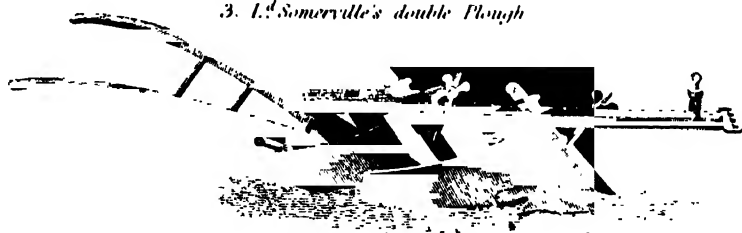
1. *Old Norfolk Plough*



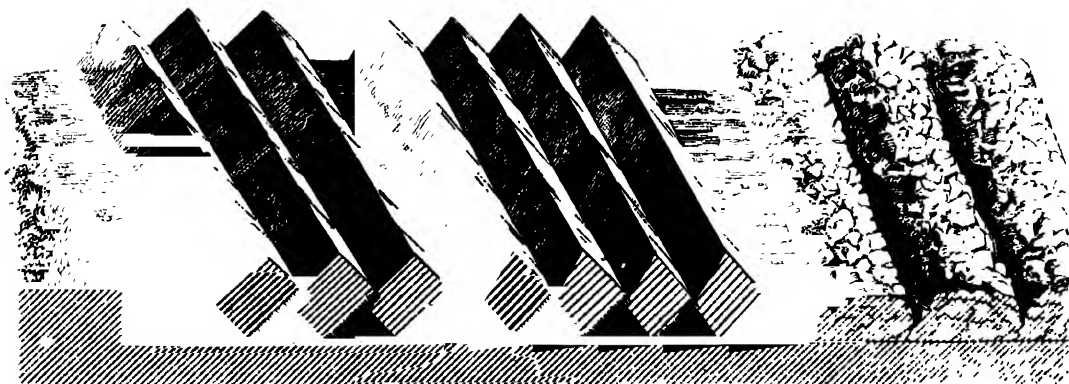
2. *Improved Norfolk Plough.*
(Beginning of Nineteenth Century)



3. *L. Somerville's double Plough*



4. *Various Styles of Ploughing*



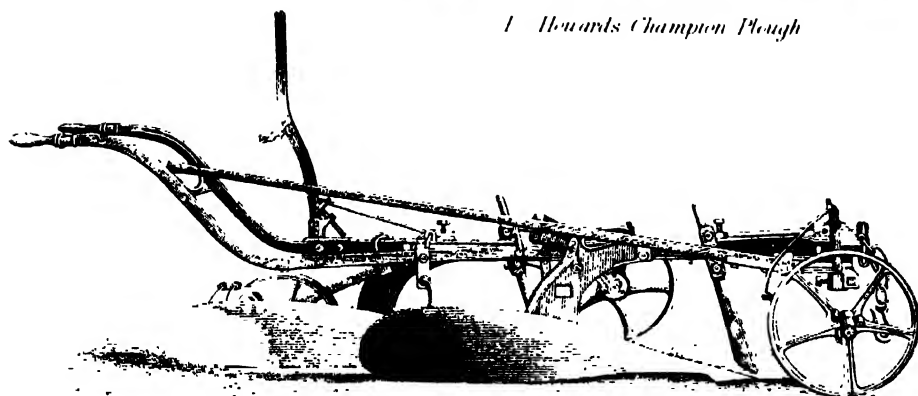
Rectangular Furrows.

Trapezoidal Furrows.

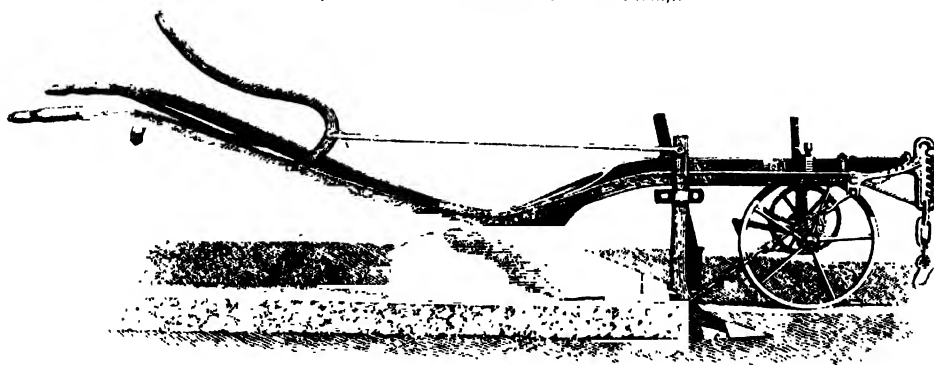
Wide Broken Furrows



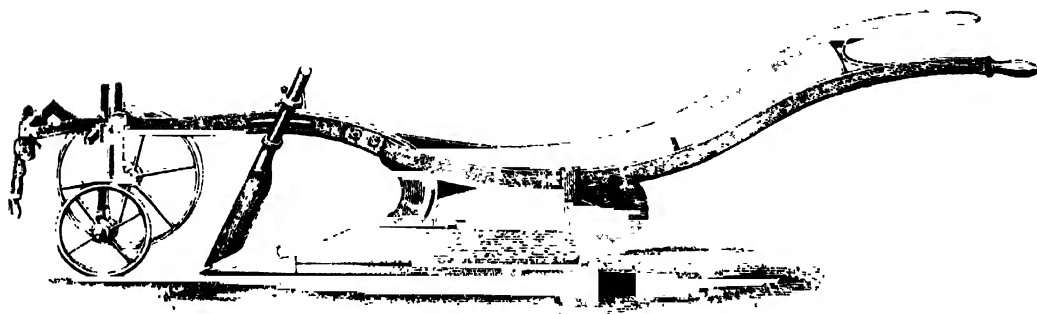
1 Howards Champion Plough



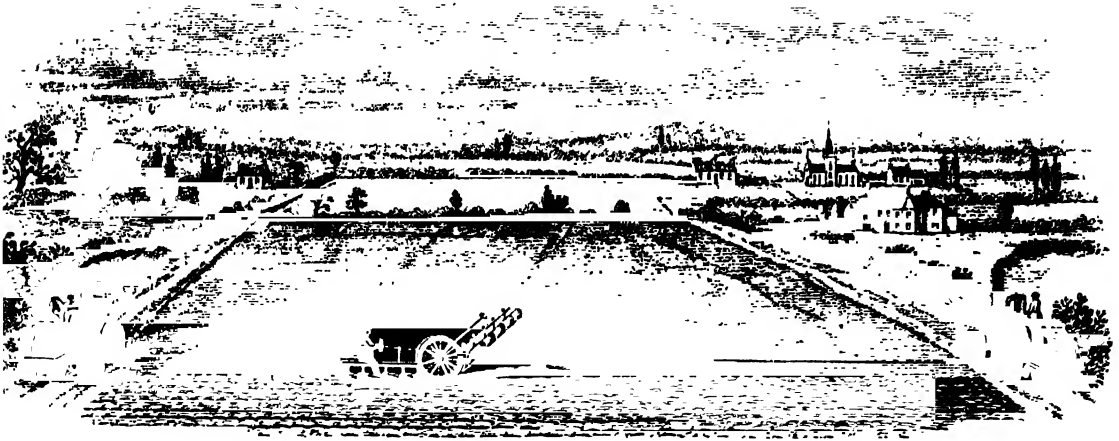
2 Double Furrow Plough



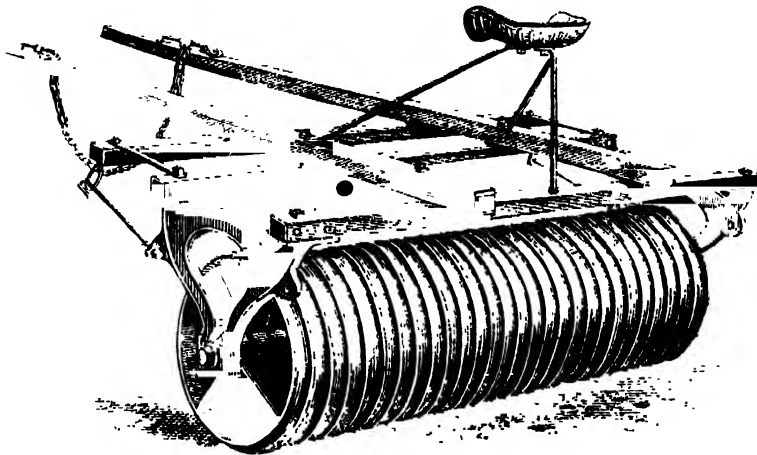
3 Ransomes Plough & Subsoiler Combined



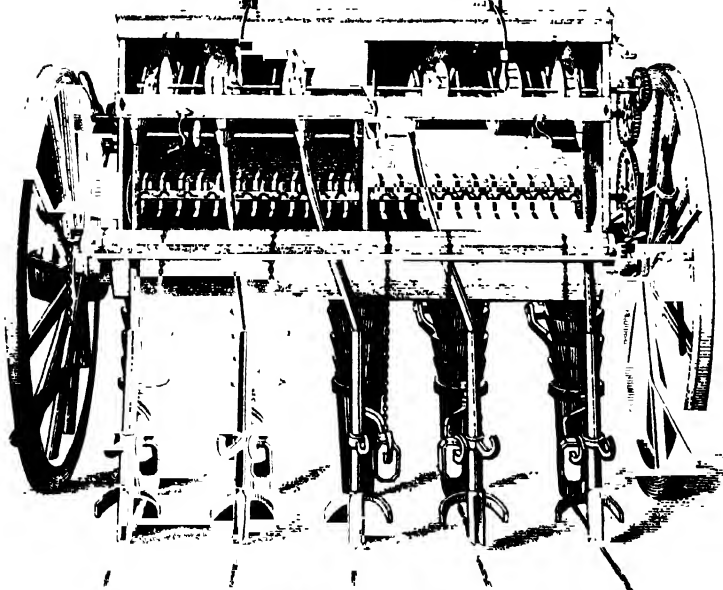
4 Howards Simplex Plough



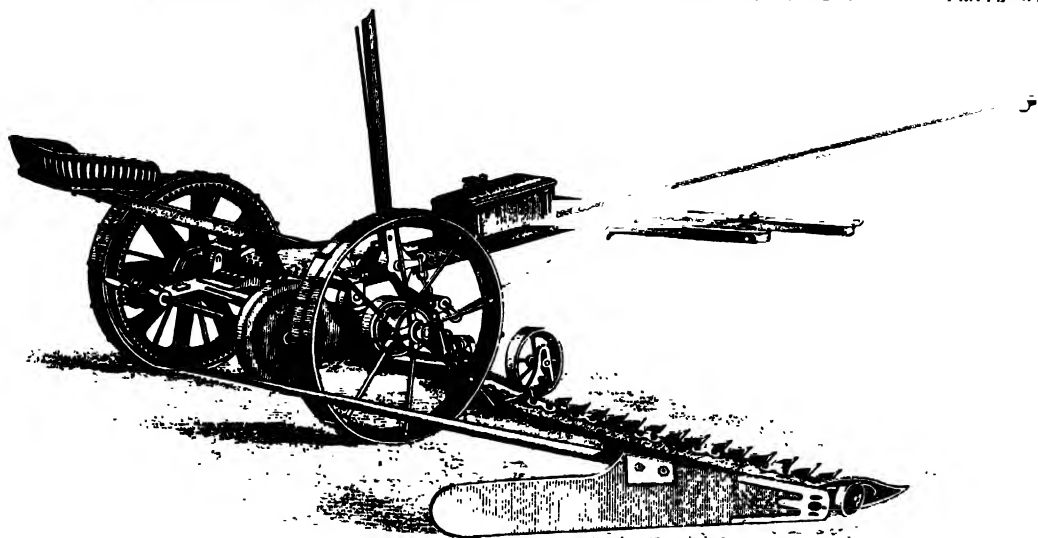
1. Steam Cultivation. Pair of Six Horse-power Engines at Work



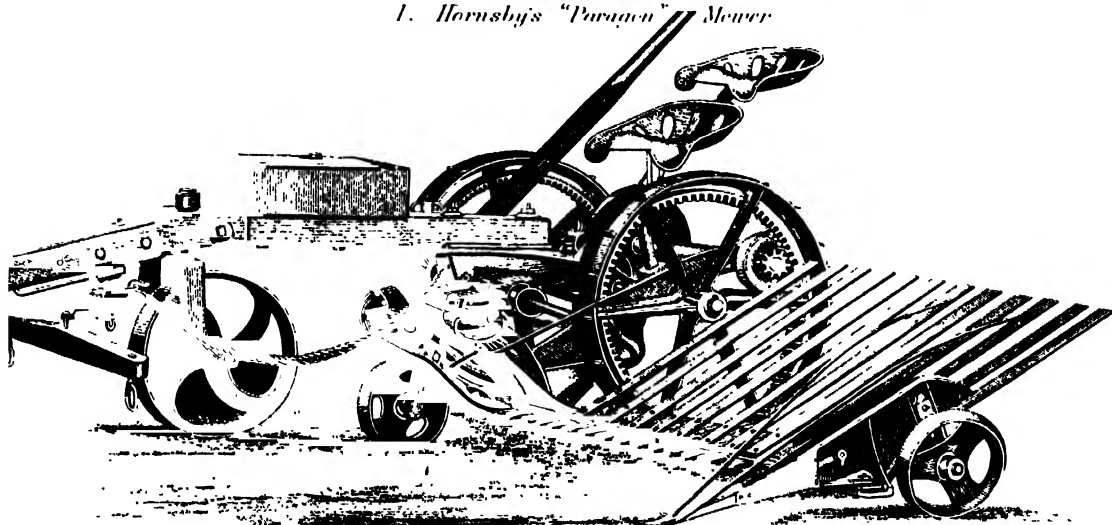
2. Fluted Roller or Chod Crusher



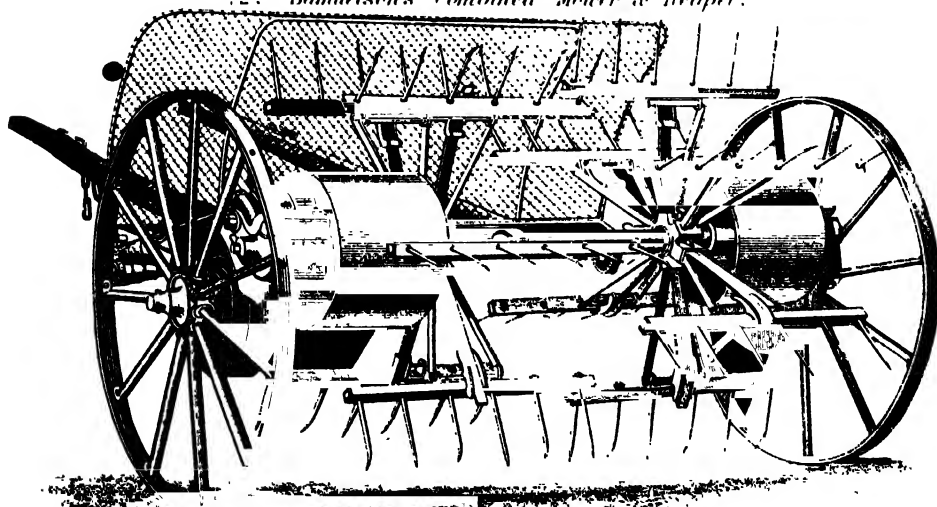
3. Drill for Turnip or Mangold wurtzel with Manure



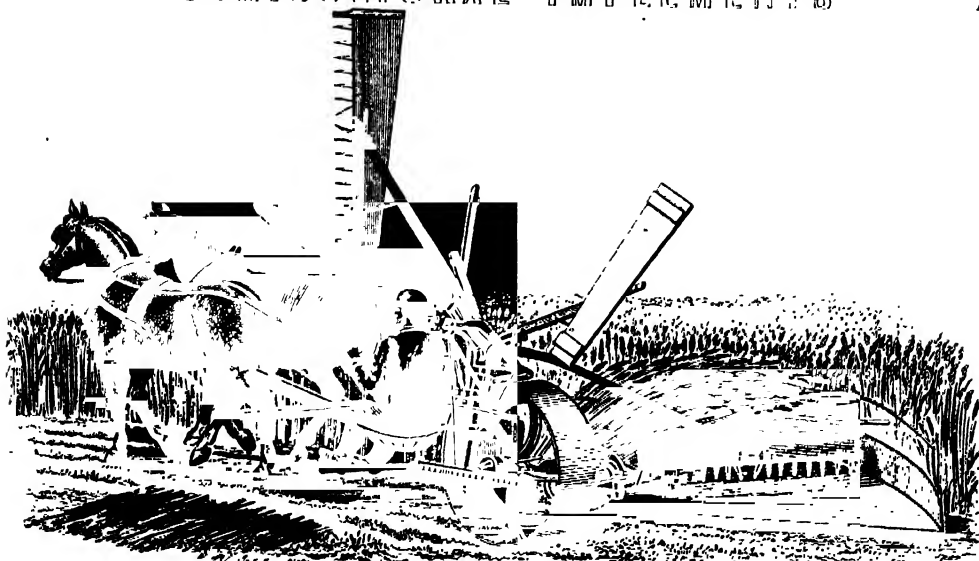
1. Hornsby's "Paragon" Mower.



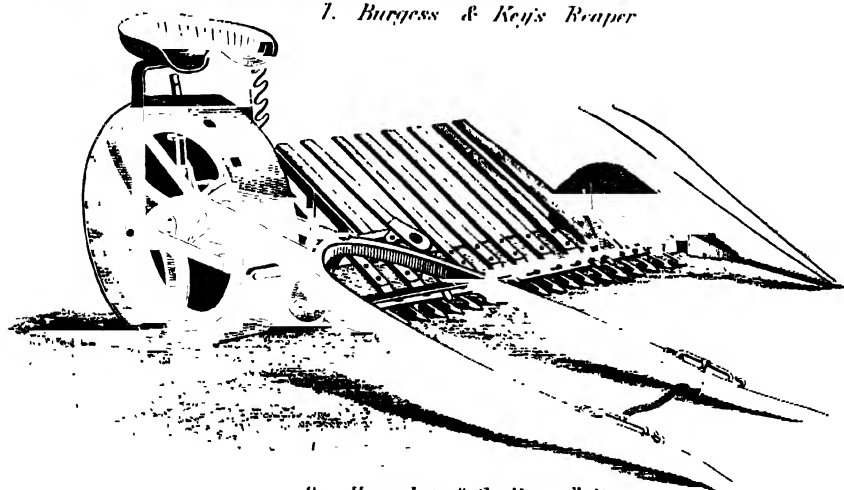
2. Samuelson's Combined Mower & Reaper.



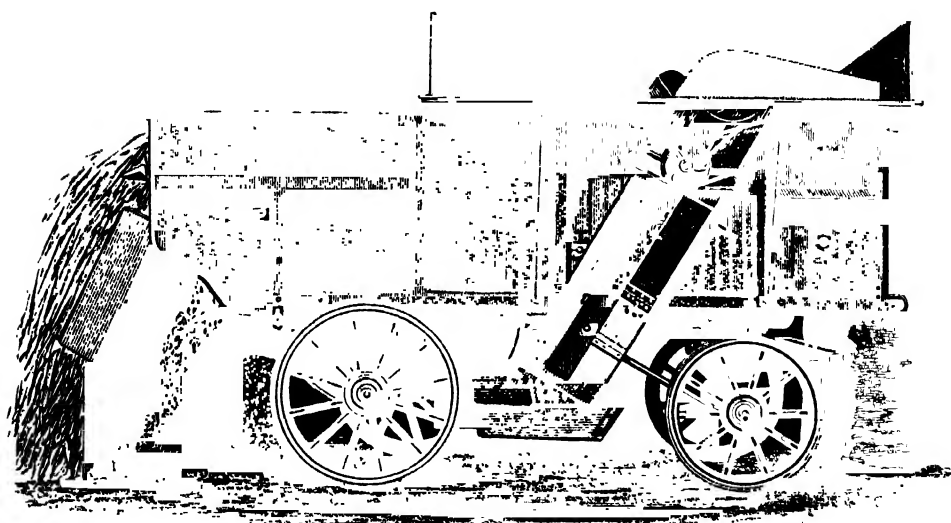
3. Hay Maker.



1. Burgess & Key's Reaper



2. Hornsby's "Challenge" Reaper.



3. Finishing Steam Thrashing Machine.

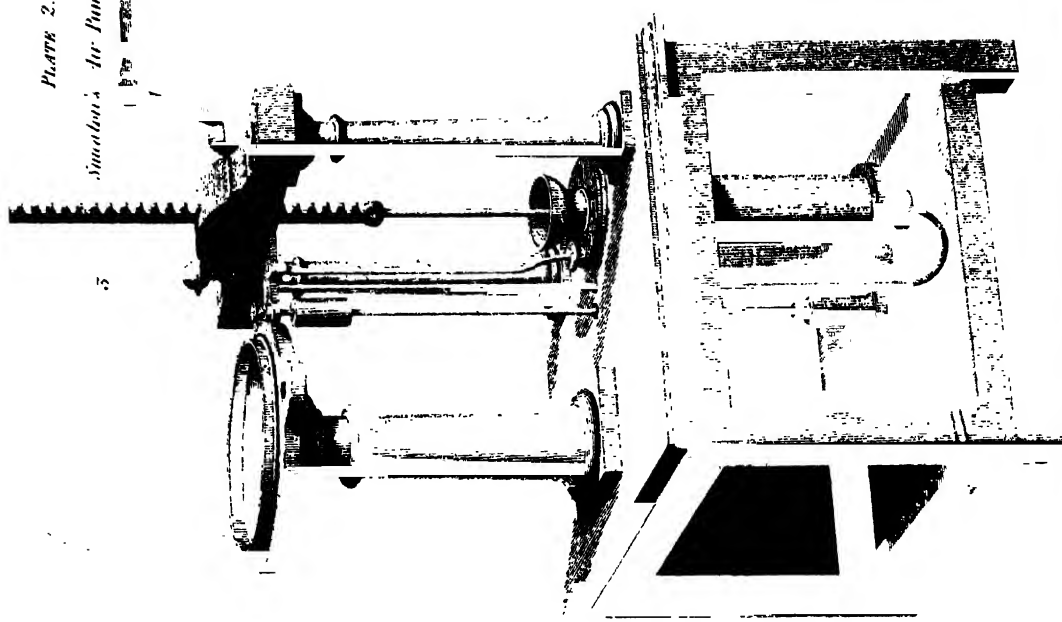
ALPHABET.

PLATE 2.

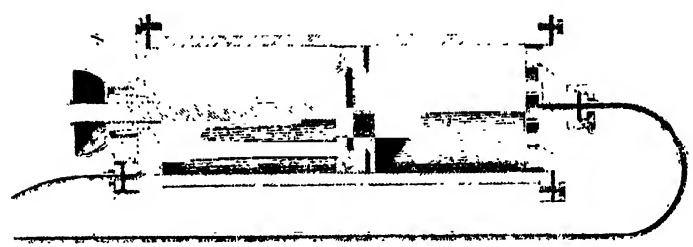
EGYPTIAN HIEROGLYPHIC WRITING.

18TH CENTURY B C



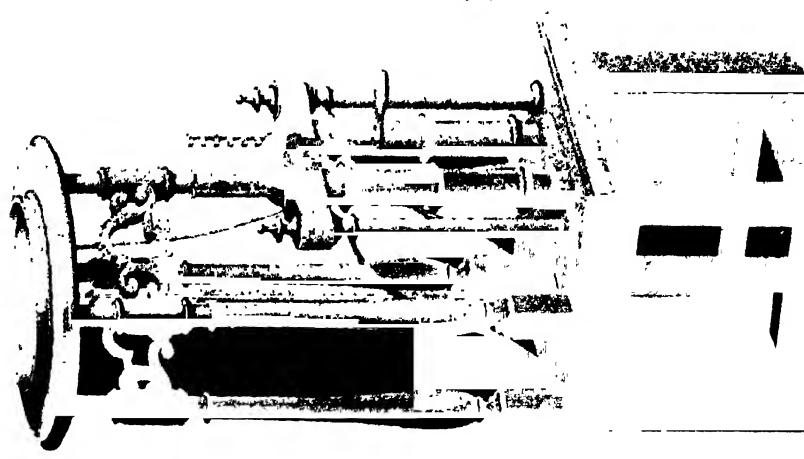


Section of the Pump.



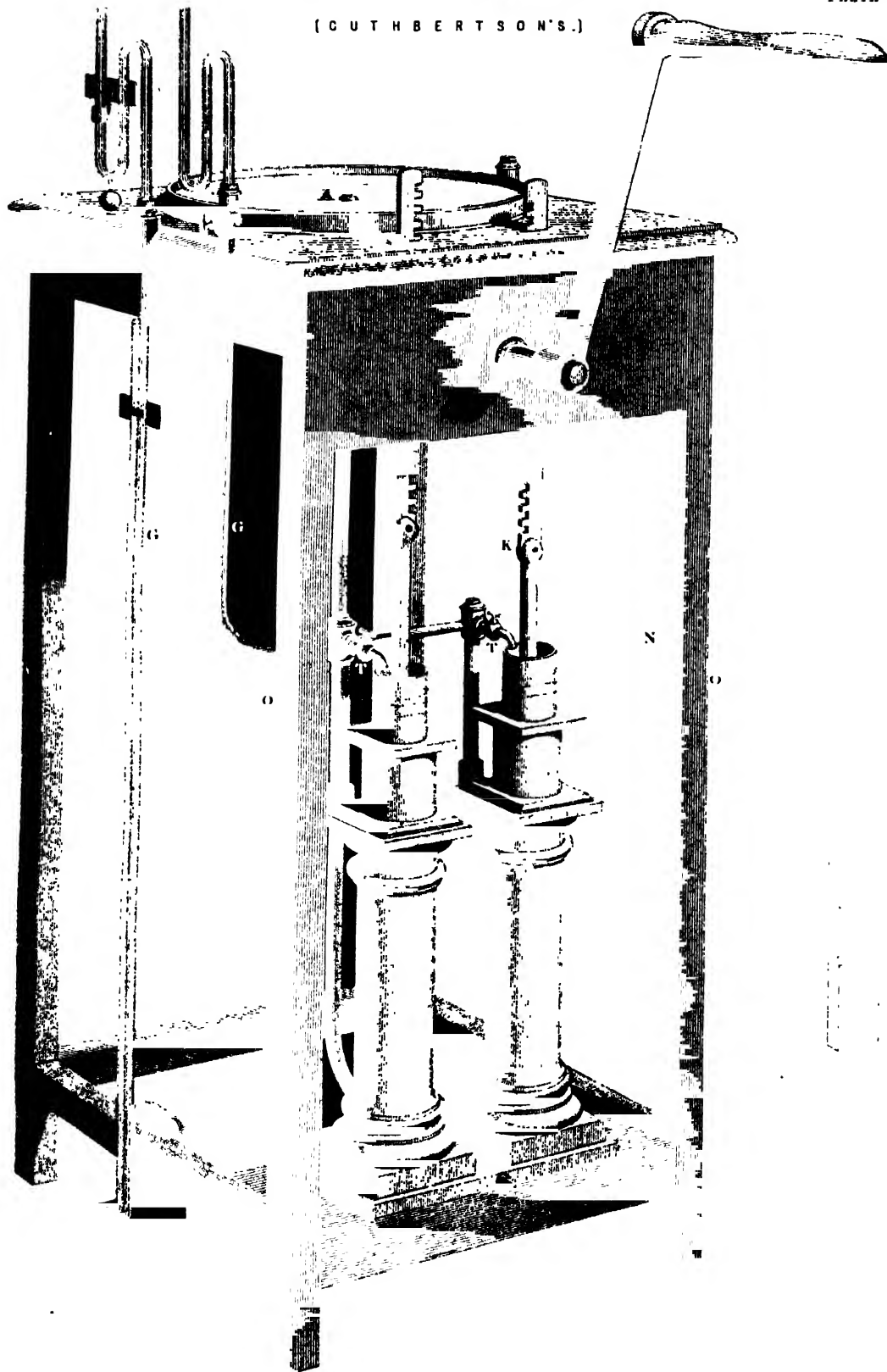
Section of the Pump.

Section of the Pump.



AIR PUMPS.
[CUTHBERTSON'S.]

PLATE I.



This crowned ruffian is further suspected, not without very good reason, of having poisoned the learned and altogether admirable St. THOMAS AQUINAS, whose philosophy to this day rules the Romish Church. Such deeds have left his name infamous for all time. An interregnum of the pontificate left Rome at his disposal, whilst almost all the cities of Lombardy imitated Florence in acknowledging him as their protector, and in swearing allegiance to him. But Charles' power, and his dream of founding an empire in Italy, were overthrown by the hands that had raised him. A pope was elected (Gregory X.) who had at heart the interest of Christianity more than those of a party. Instead of crushing the Ghibellines he sought to reconcile them to the Guelfs, and in order to remove the anarchy of Germany he procured the nomination of an emperor in the person of Rodolph of Hapsburg, to whom Charles was forced to cede the hold which he had usurped over the north of Italy. On a vacancy of the pontificate he succeeded, however, in procuring the nomination of a pope in his interests. From Martin IV. (so the new pontiff was called) he obtained the preaching of a new crusade, directed, however, not against the north of Italy, but of Greece. Whilst Charles engaged in preparations for this great project, Peter of Aragon was making similar preparations for attacking Sicily and Naples. But Charles had raised an enemy amongst his own subjects more active and deadly than any kingly rival. This was John of Procida, a Sicilian noble, a partisan of the house of Hohenstauffen, who had suffered confiscation and exile on that account. The man never rested, even during the years of Charles' greatest triumph and power, from exciting disaffection towards him; and an accident set fire to that train of disaffection and rebellion which John of Procida had prepared in Sicily.

It was on Easter Monday, in the year 1282, a day consecrated in Catholic countries to a mixture of gaiety and religion, that the citizens of Palermo set out according to custom to hear vespers at the church and village of Montereale, not far distant. The French soldiers and authorities joined the procession, and one of the soldiers grossly insulting a young girl, her betrothed lover instantly pierced the Frenchman with his own sword. This act was a signal; it corresponded so fully to the intentions and feelings of all present that the cry of "Death to the French!" ran from mouth to mouth. The deed accompanied the word, and every Frenchman in the procession was assassinated whilst the vesper bell was still sounding. Excited by blood, the assassins rushed back to Palermo to complete their massacre. Not a Frenchman save one escaped. All, to the number of 4000, were butchered; and even Sicilian women who had married Frenchmen suffered the same fate in order that the progeny of the hated strangers might be eradicated from the island.

This massacre, notorious under the name of the *Sicilian Vespers*, was of course the signal of revolt. John of Procida hastened to Peter of Aragon, who, after some delay, landed in Sicily, and assumed the title of its king. His admiral, Roger de Loria, sailed for Messina, to which place Charles had laid siege, and experienced no difficulty in capturing Charles' fleet, and defeating all his projects of vengeance. While struggling against repeated disasters, Charles of Anjou died at Foggia, in the kingdom of Naples, at the age of seventy-five, in the early part of 1285. His posterity continued to fill for a time the throne of Naples and also that of Hungary. It is rather as kings of these countries than as counts of Anjou that their history is to be read or written, since of course they had become utter strangers to this province, and to France itself.

In consideration of this, King John II. of France reunited Anjou to the crown, giving it soon afterwards in apanage to his son Louis, who thus commenced the third house of

Anjou. The county was elevated into a duchy by an ordinance of John in 1360, and Louis is thus the first of the ducal house. He was born in 1339, was taken prisoner with his father at the battle of Poitiers, and remained long in England, but at length broke his parole and fled. On the death of his brother, Charles V., he became by his nomination regent of the kingdom; but instead of consulting the prosperity of France he sought to amass wealth for the purpose of afterwards conquering the kingdom of Naples, to which Jeanne, the heiress of the last house of Anjou, had given him a title by adoption. The pope seconded the attempt of the French prince (for at this time the popes resided at Avignon, and were completely in the power of France), and Louis was accordingly crowned king of Sicily and Jerusalem at Avignon in 1382. He then led his armies to the conquest of Naples, but they perished, as Louis did himself, by disease, in 1384.

His son, Louis II., duke of Anjou, was also crowned king of Sicily by the pope; but in spite of three successive efforts he failed in establishing himself, and died in 1417.

Louis III., son of the last duke, was equally unsuccessful in his attempts on Naples, but he persevered till he died at Cosenza, in 1434.

He was succeeded, not so much in his kingdom as in his claim, by his brother René, surnamed the Good King René, who not only failed in recovering the Italian empire of his family, but was dispossessed of Anjou itself by Louis XI.

From the days of Louis XI. the title of Anjou lay dormant, whilst the kings of France themselves prosecuted their claims to Italian dominion, as heirs of the Angevin princes. With Francis I. these hopes expired. His successor, Henry II., bestowed the duchy of Anjou upon his third son, who bore this title when elevated to the throne of Poland. As this prince, however, succeeded to the throne of France, he is better known under the name of HENRY III. Henry's younger brother, at first duke of Alençon, succeeding to the title of Anjou, is best known under this latter name.

This prince was born in 1554, and was first christened Hercules, a name that was afterwards changed for that of Francis at confirmation. He had the small-pox very young, and was so "horribly spoiled" that his mother, Catherine de Medici, took a dislike to the boy, and sent him to Amboise to be educated apart from his brothers and from the court. The young prince naturally returned his mother's aversion; and this may have been the original cause of his liberality of opinion, since it threw him into the confidence and friendship of Catherine's enemies, the Huguenots. He was then proposed as a husband for Queen Elizabeth, but the massacre of St. Bartholomew, which occurred soon afterwards, created a distance between the two courts. On that occasion the Duke of Alençon maintained an honourable part. He so openly expressed his abhorrence of the event, and his admiration for Coligny, that he became as much an object of suspicion as any of the Huguenots. He was sent against La Rochelle, as to a school of martial orthodoxy, where he was nearly killed by a shot from the ramparts, but he still remained attached to the Huguenot party, who now conceived other hopes for him. Charles IX. was lingering under a mortal malady; his brother, the next heir, was in Poland. The Protestants hoped to elevate the Duke of Alençon to the throne in his place, thus exchanging a monarch whom they detested for one who favoured their own opinions. A plot was accordingly formed, which utterly failed through the perfidy and weakness of him whom it was designed chiefly to benefit. The Duke of Alençon, instead of escaping at the appointed moment, hurried to his mother's feet, and confessed the whole affair. The consequence was the arrest of all who were implicated, and the failure of the enterprise. To render the act more base on the part of Alençon, the whole

weight of vengeance fell upon his confidants and followers. Becoming subsequently reconciled to the Huguenots he escaped from court in the autumn of 1575, and placed himself at the head of the armies raised by the reformers. A truce first and a peace afterwards were the fruit of a year's show of hostility. The Duke of Alençon secretly proposed to desert his party once more; but the Huguenot chiefs insisted upon favourable terms, which they obtained, in name at least, in 1576. The duke, on his part, obtained advantages equally favourable—letters patent being soon after issued, which gave him the duchies of Anjou, Touraine, and Berri. In this arrangement, however, both sides may be said truly "to have reckoned without their host." The Catholics, disgusted with the weakness of the monarch, formed "The League," which soon rendered the articles of peace null. The Protestants on their side kept armed and in a hostile posture, and Henry of Navarre was rising amongst them to fill the place of honour that the now Duke of Anjou had ceded. War, in consequence, recommenced, and, strange to say, the Duke of Anjou himself appeared in command of a Catholic army.

In perusing the history of these times it is difficult to say where most fickleness is found, whether in princes or in the people. After having turned against the Huguenots, and even sacked one of their towns, the Duke of Anjou was still trusted by them; and when overtures were made to him by the malcontents of the Low Countries, several of the leading Protestants forsook Henry of Navarre for the banner of the Duke of Anjou.

Catherine de Medici and Henry III., reconciled to their son and brother, now laboured to procure for the Duke of Anjou those very prizes that Coligny had before sought to give him—the sovereignty of Flanders and the hand of Queen Elizabeth. At the head of a French army the Duke of Anjou marched against Don John of Austria, and was elected sovereign of the Netherlands in 1581, taking possession of Cumbay in spite of the Prince of Parma. Thus, crowned with honour, the duke hastened over to England to terminate in person his suit with the queen. Nothing could be more brilliant or warm than his reception, which, however, ended in nothing. At length the Duke of Anjou took his departure from England to govern the Netherlands, which he did with such despotic authority that the people were roused; and not only he, but the French, were expelled, amidst the general execrations of the country.

From this hour the Duke of Anjou sunk into insignificance. He was too low in fortune and in character to mingle or to have influence in any party or in any struggle. He expired soon after, in 1584, at Château Thierry.

ANKLAM, a town of Pomerania in Prussia, lying on the river Peene, 47 miles N.W. of Stettin, with which it is connected by railway as well as with Stralsund and Greifswald. The fortifications, which made it a place of considerable importance, have been demolished, although it is still encircled by a wall with three gates. It has suffered from several calamities of plague and fire. Tanglin and Wendenburg are names formerly applied to this town. It is situated 4 miles from the mouth of the river, but is a considerable port, and carries on a brisk intercourse with other countries. It possesses manufactures of woollens, linens, leather, and tobacco, and there are breweries and soap works. Shipbuilding is also carried on. The population in 1881 was 12,361.

ANKO BAR, the capital of Shoa, a kingdom in Abyssinia, has a population of 5000, and enjoys a delightful climate, being situated on the ascent of a tableland about 2200 feet above the sea. It is irregularly built, and the higher portion of the town is rudely fortified. There is a royal residence built of stone, and also several churches. The court resides here part of every year, and the population is then very much increased.

ANKYLOSIS, a Greek word (*ἀγκύλωση*) signifying "a bending." It consists of the immovable union of two bones naturally connected together in such a manner as to form a movable joint. All the movable bones forming joints may become consolidated together, or ankylosed; and cases are on record of a general ankylosis of all the bones of the human body. Whatever keeps a joint motionless for a long time together may give rise to ankylosis. Hence it is apt to occur after the fracture of a bone in the neighbourhood of a joint; because it is necessary to the cure of the fracture that the limb should be fixed in one position, while the inflammation occasioned by the violence that produces the fracture often spreads to the joint, and it is one of the ordinary effects of inflammation to agglutinate and consolidate the parts inflamed. Hence inflammation, sprains, dislocation, shocks occasioned by leaping or falling on the feet from great heights, and ulcers are the common causes of ankylosis. But ankylosis cannot always be considered in the light of a disease; at any rate, it is sometimes the happy termination of a formidable malady. The natural cure of many painful and dangerous diseases of the joints is the formation of an ankylosis.

ANN ARBOR, a city of Michigan, United States, capital of Washtenaw county, on the river Huron, with a station on the Michigan Central Railway, 38 miles west of Detroit. It is a well-built town, and has a large well-endowed state university, founded in 1837, with a good library, observatory, and laboratory. Considerable trade is carried on; wool, iron, and flour forming its chief manufactures. The population in 1880 was 8061.

ANNA COMNENA, daughter of Alexius I., Byzantine emperor, one of the most successful female writers of early times, was born in 1083. She received an excellent education, and attained to considerable proficiency in rhetoric, poetry, and philosophy. She was married to Nicephorus Briennius, and on the death of her father she planned a conspiracy, having for its object the murder of her brother and the possession of the crown. Her husband refused to join or assist in the plot, and on its failure she was deprived of her property by her brother; but he afterwards restored it to her and treated her with great magnanimity. Her husband died in 1137, and after his death she wrote a biography of her father in Greek, entitled "The Alexiad." Though written in an inflated style and displaying evident traces of the vanity of the authoress, the events recorded are so noteworthy, and her descriptions are so interesting, that her book forms one of the most valuable in the whole of the Byzantine histories. She died in a convent in 1148.

ANNA IVANOVNA, Empress of Russia, the second daughter of the Czar Ivan, the elder half-brother of Peter the Great, was born on 8th February, 1694. In 1710 she married Frederick William, duke of Courland, who died without issue in the following year. On the death of Peter II. the throne of Russia was offered her by the supreme council on conditions which, if carried out, would have changed the government from a despotism to a limited monarchy. With great perfidy she accepted the crown on the terms offered, and as soon as she had gained possession of it openly repudiated her promises, and proclaimed herself "Autocrat of all the Russians." Her policy, however, at the outset was humane and beneficial. She discouraged gambling and drunkenness, improved the army, paid the government debts, and lowered the amount of the poll tax levied on the serfs. She also encouraged music, and introduced the Italian opera into St. Petersburg. A change, however, soon took place in the conduct of the government. Her paramour, a Courlander of low birth, named Biron, whom she had raised to a high position, determined to make his influence felt in the country. He was a monster of avarice and cruelty, and the records of his oppression

almost exceed belief. He established a reign of terror in Russia; large numbers of the people were put to death by the knout or the wheel, had their tongues cut out, or were banished to Siberia. It is said that at least 20,000 suffered the latter punishment, while the number slaughtered reached nearly 11,000. Happily for the country, however, the reign of the empress was but a short one. She was taken ill in September, 1740, and after settling the succession to the throne by appointing the Prince Ivan, an infant three months old, successor, with Biron regent of the empire, she died 28th October. Biron did not long retain his office, being overthrown and banished to Siberia within a month of the death of the empress.

The principal events of her reign were a war with France in conjunction with Austria, in which 10,000 Russian troops advanced as far as the Rhine, and were the first which had ever been seen in the centre of Europe; and a war with Turkey which commenced in 1736, and closed in 1740.

ANNABERG, a town in the Erzgebirge (Ore-Mountain) district of Saxony, about 36 miles S.W. of Dresden, 1800 feet above the level of the sea, containing 12,936 inhabitants. It has considerable manufactures of cotton lace, bobbinet, and ribbons, and near it are silver, tin, cobalt mines, and marble quarries. Annaberg has a handsome church, orphan asylum, high school, and savings bank. Protestant refugees introduced the ribbon manufacture from Belgium, from whence they were driven by the Duke of Alva.

ANNAH, a town of Turkey in Asia, on the right bank of the Euphrates, about 160 miles N.W. of Bagdad. The town, opposite which is a line of cultivated islands, consists of a long narrow winding street, at the base of the hills which here line the river. It contains several mills, some for irrigating the fields and others for grinding wheat, and the remains of four ancient castles; there are also two mosques, and a beautiful minaret 80 feet high. The number of houses is about 1800. Annah has always been a town of some importance from its position in the desert, and serves as a resting place between Bagdad and Aleppo, and between Basra and Aleppo. The remains of old Annah, the *Anatho* of Isidore, cover one of the islands, and extend 2 miles along the west bank of the river. Population, 3000.

ANNALS (in Latin *annales*) is derived from *annus*, a year. Cicero in his second book, "On an Orator" ("De Oratore," c. 12), informs us that from the commencement of the Roman state down to the time of Publius Mucius, it was the custom for the Pontifex Maximus annually to commit to writing the transactions of the past year, and to exhibit the account publicly on a tablet (*in albo*), where it might be read by the people. Mucius was Pontifex Maximus in the beginning of the seventh century from the foundation of Rome. These are the registers, Cicero adds, which we now call the "Annales Maximi," the great annals. It is probable that these annals are the same which are frequently referred to by Livy under the title of the "Commentarii Pontificum."

The word annals, however, was also used by the Romans in a general sense. Cicero, in the passage in his work "De Oratore," says that the first narrators of public events, both among the Greeks and Romans, followed the same mode of writing with that in the "Annales Maximi," which he further describes as consisting in a mere statement of facts briefly and without ornament. In his work "De Legibus" he characterizes history as something distinct from this, and of which there was then no example in the Latin language. It belongs, he says, to the highest class of oratorical composition.

The distinction which the historian Sempronius Asellio made between annals and history is this, as quoted by

Gellius—"Between those who had intended to leave annals, and those who had attempted to narrate the acts of the Roman people, there was this difference: annals only affected to show what events took place in each year, a labour like that of those who write diaries, which the Greeks call *ephemerides*. To us it seemed appropriate not merely to state what had been done, but also with what design and on what principle it had been done."

An account of events digested into so many successive years is still usually entitled, not a history, but annals.

ANNAMABOE or **ANNAMABOO**, a town with a fort belonging to the English, on the Gold Coast in West Africa. It is 10 miles E. from Cape Coast Castle. The fort is considered to be the strongest on the coast. It is of a quadrangular form, and is built on a low site close to the shore, the town surrounding it in the form of a crescent, and coming down to the sea on both sides of it. The inhabitants are chiefly employed in the trade in gold, of which this fort has long been the chief mart. They also export palm-oil, ivory, and grain, and receive a large amount of manufactured articles in return. A ledge of rocks extends in front of the town a few yards from the shore, and makes a good breakwater. The town was burned by the Ashantees in 1807. Population, 1500.

ANNAN, a town of Dumfriesshire and one of the most ancient of Scotland, is situated on the east bank of the river Annan, near the Solway Frith, 15 miles E. by S. of Dumfries, on the Glasgow and South-western Railway. It has also important connections by means of a branch line which crosses the Solway Frith. It is well built, and new water and drainage works were completed in 1883. The neighbourhood is studded with villas, and there is good salmon fishing in the river. The church has a handsome spire. The town-hall was rebuilt in 1876-77, in the Scottish baronial style. A stone bridge of three arches was erected in 1824 in place of the old wooden one. The harbour is formed by a creek of the Solway Frith at the mouth of the river, and can be entered by vessels of 250 to 300 tons burden, and vessels of 60 tons burden can sail up the river to the bridge at Annan. Jetties have been formed, where steamers plying between Liverpool and Whitehaven call regularly to take in cattle, horses, sheep, corn, goods, and passengers. Some ship-building is carried on, and there are a cotton mill and large bacon and ham-curing establishments. There are also tanning establishments and roperies. At the mouth of the Annan river, on which the town stands, there is a very productive salmon fishery. Annan is a royal burgh, and is contributory to the Dumfries parliamentary district. The town is governed by a provost and fourteen councillors, which includes three bailies. It is supposed to have been a Roman station. Edward Irving, the celebrated preacher, was a native of the town, which also gave birth to Hugh Clapperton, the African traveller. In 1332, after the death of King Robert, Edward Balliol, having been crowned at Seome, summoned the barons here to swear fealty to him; but he was surprised by a force under Archibald Douglas, and escaped to Carlisle. The population in 1881 was 3336.

ANNAN, the river, takes its rise in the Hartfell Mountain, near the source of the Tweed. Its tributaries are the Moffat, Evan, Kinnel, Wamphray, and Milke; and its total length is 40 miles. *Annandale* was the name formerly given to a stewardry comprising a large portion of the county of Dumfries.

ANNAPOLIS, a city and port of entry in the United States, capital of Maryland and of Anne Arundel county, stands on the west bank of the Severn, 2 miles from its mouth in Chesapeake Bay, and 25 miles E.N.E. of Washington. Annapolis, though only an inconsiderable place, with a population of 6612 in 1880, has been the

seat of government for Maryland ever since 1699. It is connected by railway with Baltimore and Washington. It possesses a fine state-house and naval academy, established in 1845, supported by the government; and is also the seat of St. John's College. The city was established in 1649, under the name of Providence, but took its present name from Queen Anne in 1708, when it received a charter.

ANNAPOLIS, a county of Nova Scotia, bordering on the Bay of Fundy. The first European settlement on the mainland of North America was made by the French in the year 1604, at the place where the town of Annapolis now stands. The French settlement was called Port Royal, and was taken by the English in 1611, and again in 1710. On this last occasion the name of the town was changed to Annapolis in honour of Queen Anne; at the same time the province, which had been called Acadia by the French, had its name changed to Nova Scotia. Under this name it was ceded to England by France in 1713.

The town of ANNAPOLIS, formerly the seat of government of the province, is built on a peninsula, formed where the two rivers Annapolis and Allen discharge themselves into Annapolis Bay. It has a good harbour, but since the building of Halifax, the present capital, it has lost much of its importance. Population, 1000.

The river ANNAPOLIS rises in the township of Cornwallis, and falls into the Bay of Fundy, through Digby's Gut, having previously expanded into a wide estuary called Annapolis Bay. The river is navigable for boats and small vessels through the greater part of its course.

ANNATES or FIRST FRUITS, a term derived from the Latin word *annus*, a year, and used in the ecclesiastical law of England to denote the sum paid by any person presented to a church living, and which in former times was its estimated value for a whole year.

For many centuries this was claimed by the pope from all persons appointed to bishoprics and abbeys, and as the needs and capacity of the papacy increased it was extended until it included every spiritual benefice in Christendom. In England frequent objections were made to its payment, and as early as the reign of Edward III. the pope offered to compound his claims for an annual tax. By Henry VIII. a valuation of all benefices was made, and the payment of annates and other dues which had been made to the pope was, by the Statute of Recusants, annexed to the crown. In the reign of Queen Anne the income derived from this source was set apart for the maintenance of the poorer clergy. The various laws upon this subject were all consolidated in the Act 1 Vict. c. 20. The fund is managed by the governors of Queen Anne's Bounty, and though the income derived from the annates and tenths does not amount to more than £16,000 a year, the immense property of the trust derived from a parliamentary grant fund, investments, and the sums given by private benefactors, enables the governors to pay more than £100,000 a year to the clergy.

ANNATTO or **ARNOTTO**, the inspissated extract from the fruit of the *Bixa Orellana*, is used by dyers to give a bright orange colour to silk goods, and to give a deeper shade to simple yellow colours. The dye is collected by pouring boiling water on the fruits, and stirring. The liquid is then passed through a sieve, and the deposit dried to form annatto. The residue left in the sieve on the first straining is again treated with boiling water until the seeds are left naked. Annatto is used in many dairies to give a reddish colour to cheese, which it does without adding any disagreeable flavour or unwholesome quality. The annatto of commerce is brought from South America. It is moderately hard, brown on the outside, and of a dull red within. It comes in cakes of about 2 or 3 lbs. weight each, and is generally enveloped in large flag-leaves previous to being packed in casks. In this state it

receives the name of flag annatto, to distinguish it from a variety called roll annatto, which is received in balls. In Gloucestershire it is the practice to allow 1 oz. of annatto to 1 cwt. of cheese; in Cheshire 8 dwts. is considered sufficient for 60 lbs. In South America annatto is often used to give a beautiful tint to chocolate. It is employed in medicine for colouring plasters, ointments, &c., and is also an ingredient in some varnishes. It dissolves in alkalies, producing a brown solution, from which it is precipitated yellow by acids.

ANNE, Queen of England, the second daughter of James II. by his first wife Anne Hyde, was born at Twickenham on the 6th February, 1664. She was educated in the religion of the Church of England; and in 1683 was married by the Bishop of London to Prince George, brother of Christian V., king of Denmark. At the revolution in 1688 Anne and her husband adhered to the dominant party of her brother-in-law, William III.; and by the act of settlement the English crown, in default of issue to William and Mary, was guaranteed to her and her children. During the reign of William she appears to have lived in much discomfort, neglected by her sister and treated with coldness by the king; and she sustained the heavier infliction of losing all her children in infancy, except one son, the Duke of Gloucester, who died at twelve years of age, in 1699. This event, as well as the previous death of Queen Mary, rendered an alteration in the act of settlement necessary; and the Princess Sophia, dowager electress of Hanover, and her descendants, being Protestants, were declared next heirs to the throne, in default of direct heirs to William and his sister-in-law Anne.

Anne ascended the throne upon the death of William III., on the 8th March, 1702. On the 4th May, within two months afterwards, war was declared by England, Germany, and Holland, against France and Spain. The struggle which ensued, and which is historically known as the War of Succession, was long and obstinate. Most of the leading events, and especially the extraordinary campaigns in the Low Countries and Bavaria, are described in the life of MARLBOROUGH, and the brilliant successes of the English arms in Spain under Lord Peterborough will be found in the article MORDAUNT.

The legislative union of Scotland and England, completed on the 6th March, 1707, was one of the most important events in the reign of Anne, of which the progress and consequences are detailed in their proper place. See SCOTLAND.

During the brilliant course of Marlborough's conquests the spirit of political intrigue, which was perhaps never more fully developed than in the latter years of the reign of Anne, was stifled by the enthusiasm of the people. But ultimately the war became unpopular, and in the elections of 1710 the Tory supremacy was established. The Duchess of Marlborough, to whose talents and decision of character the queen had long submitted, was thrust out by the new favourite, Mrs. Masham. The ministry of Godolphin and Sunderland was displaced by that of Bolingbroke and Oxford. The command of the army was taken from Marlborough and bestowed upon the Duke of Ormonde. During the progress of these convulsive changes, which must have been distracting enough to the quiet temper of Anne, she was deprived of the sympathy of her placable husband, who died on the 28th October, 1708.

The first act of the Tory ministry was to enter upon arrangements to bring the war to a conclusion. In 1711 negotiations were entered into with France, amidst the protestations of the allies of Great Britain, and these negotiations, after various difficulties, were terminated by the memorable treaty of Utrecht, 11th April, 1713. The Tory ministry was, however, shattered by the quarrels of Oxford and Bolingbroke; the Whigs carried the nation

along with them in their denunciation of the peace of Utrecht, which had left the country little besides a barren glory; and the dissatisfaction with the union of Scotland threatened to break out in open insurrection. The health of the queen gave way under these distractions. On the 20th July, 1714, she prorogued parliament for a month, and falling almost immediately after into a state of weakness and lethargy, died on the succeeding 12th of August. It is said that her last words were an expression of pity for her brother. ("History of England during the Reign of Queen Anne until the Peace of Utrecht," by the Earl of Stanhope, 1870; "The Reign of Queen Anne," by J. H. Burton, 1880.)

The reign of Anne has been called the Augustan age of English literature, as it produced Addison, Arbuthnot, Congreve, Pope, Prior, Steele, and Swift, all writers of a high degree of excellence.

ANNE OF AUSTRIA, Queen of Louis XIII. of France, and regent during the minority of Louis XIV., occupies a prominent place in French history. Daughter of Philip II. of Spain, she became the wife of young Louis XIII. in the year 1615. The great Henry IV. of France had for his darling project the humbling of the house of Austria. His queen, Marie de Medicis, was averse to this policy, and no sooner was Henry in his grave than she took measures for a reconciliation with Spain, and sealed it by a double marriage, one of which was that of young Louis XIII. with Anne of Austria. The administration, however, fell in a few years into the hands of Cardinal Richelieu, who resumed Henry IV.'s views of humbling the pride and ambition of the house of Austria. In this he instantly found an opponent in Anne of Austria, and a struggle ensued between them, in which Anne was compelled to yield to the great minister. The cardinal by his intrigues contrived to render the king jealous and suspicious of her, to implicate her in the conspiracies of Gaston, the king's brother, and some of the nobility, and to avail himself of the folly of the Duke of Buckingham in avowing a passion for her. She thus remained without influence, alienated from the king's affections and council, till death took away monarch and minister, and left to Anne, as mother of the infant king, the undisputed reins of power.

There was then a change of policy similar to that which had taken place on the death of Henry IV. Anne chose for her minister the Cardinal de Mazarin. Mazarin, like his predecessor, might have triumphed over the noblesse alone; but this class now called to its aid a new and hitherto neglected body, that of the citizens or bourgeois class. These were easily inflamed against Mazarin, as a foreigner, and as a financier fertile in the invention of new taxes. An attempt on the part of the queen to treat the magistrates as she had treated the Duke of Beaufort, by imprisoning them, gave birth to a popular insurrection, which proved successful. The queen and court were for a time prisoners in the Palais Royal, and compelled to submit to the dictates of the mob. A civil war commenced between Anne, her minister, and their adherents on one side, and the noblesse, the citizens, and people of Paris on the other. It might have been easily supposed that the advantage in such a quarrel must necessarily remain to the latter. But Anne, with the aid of Mazarin's address, after many vicissitudes of fortune, came off triumphant. A suspension, or rather a cessation, of hostilities was produced by the retirement of Mazarin. He returned, however, for Anne was but a cypher without her minister, and the war again broke out. The court had secured a defender in Turenne, who triumphed over all the valour of the young noblesse, although headed by the great Condé. Anne of Austria's triumph was that of monarchy. She, or at least the events of her regency, contributed far more to it than all the subsequent impiousness of Louis XIV.; and hence

the epoch of Anne's administration is one of the most important in French history. Her influence over the fate and the court of France continued for a long time; her Spanish haughtiness, her love of ceremony, and of all the pride of power, were impressed by education upon the mind of her son, Louis XIV., who bears the blame and the credit of much that was hers. Anne of Austria died at the age of sixty-four, in the year 1666.

ANNEAL'ING is the process by which the extreme brittleness common to glass and several of the metals, when cooled suddenly after melting or being raised to a great heat, is avoided or removed. The theory of the process is that when a solid body which has been highly heated, melted, or subjected to the strain of many blows with the hammer is allowed to cool quickly, the molecules of which it is composed do not assume their most stable position in relation to each other; but when allowed to cool very slowly the opposite result is obtained, and the material becomes tough and strong. In the manufacture of glass, the vessels, after being shaped out of the molten material, are afterwards placed on iron trays, and drawn slowly through an oven which becomes gradually hotter until it reaches nearly the fusing point, and then gradually cooler until the articles can be drawn out cold. The time required for the process varies from twelve hours for small articles to days or weeks for those of larger size. A new development of this process has recently come into use, in which the glass, after being heated, is cooled in oil, by which means it gains great toughness and strength without any loss of transparency.

The process of annealing enters very largely into the working of metals, and is used in the hammering out of copper and brass vessels, in wire drawing, boiler-plate rolling, and in the manufacture of medals and coins. Iron castings which have been thus softened are known as malleable.

The tempering of steel is also a process of annealing, and by a careful adjustment of temperatures the metal can be manufactured with varying degrees of hardness or toughness, from a surgeon's lancet to the hair-spring of a watch.

Some metals require to be rolled as well as annealed; thus zinc, which is incapable of more than a very slight extension under the hammer without cracking, becomes almost as flexible and tough as copper after being rolled at a moderate heat.

AN'NECY, an episcopal city and the capital of Haute Savoie, France, stands on the north bank of the Lake of Annecy, at the extremity of a beautiful plain surrounded by mountains, 22 miles N.N.E. of Chambéry and 21 S. of Geneva. It is the principal seat of manufacturing industry in Savoy, and has establishments for linen-bleaching, cotton-spinning, calico-printing, and glass-making. Some coal and iron mines are worked in the neighbourhood. The population in 1882 was 11,000. In addition to the cathedral and bishop's palace there are several churches, in one of which are preserved the relics of St. Francis de Sales; and a ruined castle, formerly the residence of the counts of Geneva, who made Annecy their capital. It passed from them to the house of Savoy, and was transferred to France in 1860. The village of *Annecy le Vieux* in the neighbourhood has several Roman remains. The Lake of Annecy is about $9\frac{1}{2}$ miles long by 3 wide, and stands 1500 feet above the sea; its greatest depth is 196 feet. By means of an hydraulic engine its waters are discharged into canals which cross the streets of Annecy, and finally fall into the river Fier, which in its course turns the oil, fulling, corn, and paper mills of the district.

ANNEL'IDA, red-blooded worms, as the common worm, the lugworm, the leech, &c., are an extensive class

of animals, having an elongated form, with soft semi-cartilaginous annulations at certain distances from each other, connected together by longitudinal and oblique muscles, enabling the animals to twist themselves in various directions. The whole is covered with a moist skin, indicating by segments, more or less apparent, the soft annelli or rings; the first segment is furnished with a mouth, and, where they exist, with eyes, tentacles, &c.; the last segment is sometimes furnished with bristle-like appendages, and sometimes, as in the leech, is dilated into a sucker. Each segment, moreover, is usually beset with minute setæ or spines, of use in locomotion. In the tube-worms and sand-worms vascular tufts (*branchiæ*) are present, constituting a respiratory apparatus. The "blood" is red or green, and there is a system of veins and arteries. The sexes are either distinct, or united in the same individual. The nervous system consists of nerve-knots (*ganglia*), united by means of a double nervous cord. Most of these creatures are defenceless, and seek safety by retreating into holes, which they bore in the soft earth, in the mud, or sand. Some, as *Terebella* of the sea-shore, agglutinate around them particles of sand and of broken shells, which form a case in which they dwell. The *Serpula* exudes a calcareous secretion, which, hardening, forms a long twisted tube in which the animal resides, and from which it protrudes its head and beautiful respiratory tufts. The *Annélida* are divided into four orders—(1) *HIRUDINEA* (leech), with a suctorial mouth and without branchiæ; (2) *OLIGOCHAETA* (earth-worm, mud-worm), without branchiæ; (3) *EREBANTIA* (sea-mouse, lob-worm), with branchiæ along the back or sides; (4) *TUBICORÆ* (*Serpula*, *Terebella*, *Spirorbis*), with branchiæ on the head. *Annélida* is one of the classes belonging to the sub-kingdom VERMIS. In the article EARTH-WORMS will be noticed Mr. Darwin's researches on their action in the formation of "vegetable soil."

ANNIVERSARY is a term used to express the yearly return of any remarkable day—as the anniversary of the Gunpowder Plot on the 5th of November, the anniversary of the Restoration of the Stuarts on the 29th of May, &c.

Literary and scientific associations generally celebrate the anniversary of their original institution, and social parties are held in domestic life on the birthdays of heads of families, &c.

ANNO BOM, the most southern of the four islands in the Bight of Biafra, 1° 21' S. lat., and about 5° 41' E. lon., is 4 miles long and 2 broad. It is mountainous, and rises abruptly from a great depth to the elevation of nearly 3000 feet. The regular winds are from the S.W. This island is chiefly visited for supplies. There is plenty of water on the island, but the heavy surf on the shore makes it difficult to procure. The population is about 3000, who live chiefly in a large village near the north-east point of the island, off which there is a tolerably safe roadstead. The natives are negroes, and profess the Roman Catholic religion, but are very ignorant. Both Spain and Portugal claim the island, but neither country exercises any jurisdiction over its affairs. It was discovered by the Portuguese on 1st January, 1483; hence its name—"Anno Bom," New Year.

ANNONAY, a town of France, and the largest in the department of Ardèche, 37 miles S. of Lyons, is built in the rocky gorges of the Cance and the Déoue, which unite in the centre of the town. There are numerous establishments for the manufacture of kid and lamb skins for glove leather. There are also several silk mills, and paper factories which produce some of the best paper in France. The production of white silk for the manufacture of blondes and tulle is also extensively carried on. There is a Gothic church built in the fourteenth century. In the Grande Place there is an obelisk to the memory of the brothers

Montgolfier, inventors of the air balloon, who were natives of the town. The population in 1882 was 16,000.

ANNOTTO. See **ANNATTO**.

ANNUAL REGISTER. The first *Annual Register*, properly so called, which appeared in this country was the well-known and valuable work under that title which was published in 1759, and which has been continued ever since. The previous works approaching this character were the *Political State of Europe*, published from 1711 to 1739, and the *Historical Register*, from 1716 to 1738. The *Annual Register* was very well received, and the first few volumes passed through five or six editions. The historical narrative was written by Burke, who also probably edited the publication, and who continued to take a great interest in it as long as he lived. The contents at the outset were somewhat varied, and the earlier numbers contained, in addition to the record of the events of the year, chapters on new projects in mechanics, manufactures, agriculture, and medicine, short essays on "characters," natural history, antiquities, &c., reviews of books, and a collection of poetry, original and translated. The work gradually fell into arrear, but since 1801 it has proceeded regularly at the rate of a volume a year. Indexes to the work have been issued at various periods, and it forms a very valuable repository of history. In 1781 a rival was started in the *New Annual Register*, which was continued until 1825. Another, entitled the *Edinburgh Annual Register*, was commenced in 1808, and terminated in 1827. It numbered among its contributors Sir Walter Scott and the poet Southey. A French work in imitation of the English was commenced in Paris under the title of *Annuaire Historique Annuel* in 1818. It ran until 1849, and the following year was superseded by the *Annuaire des Deux Mondes*, an elaborate work connected with the well-known review of that name, which is still continued. There is also an *American Annual Register*, which is published at New York.

ANNUALS. By this name gardeners designate all plants which, if sown in the spring, will flower, perfect their seed, and perish in the course of the same season. If two seasons are generally requisite for this purpose they then call plants biennials; but, in fact, they are both of the same nature. Annuals, if sown in the autumn, become biennials; and biennials, if sown early in the spring, will go through every stage of life in the course of the same year. The only difference between them, therefore, is that biennials are rather longer in completing the term of their existence than annuals are.

Two things only are to be observed in the management of tender annuals beyond the ordinary practice of every gardener. First, they should not be raised in a very high temperature, if they are afterwards to be planted in the open air; and secondly, the seedlings should never be transferred from the seed-pan at once to the open ground, but should always undergo the intermediate operation of being transferred into small pots.

ANNUITIES, POST OFFICE. In order to encourage the practice of thrift and of self-help among those to whom the ordinary commercial methods are not available, or are regarded with distrust, the business of life insurance, and the granting of small annuities, has been undertaken by the Post Office. By the Act 27 & 28 Vict. c. 48, the post-master-general was empowered to grant immediate or deferred annuities of £50 on the lives of persons of either sex, and of the age of 10 years and upwards. But in the eighteen years which elapsed after the passing of the Act, the public had availed themselves of its provisions to such a very slight extent, that in 1882 a select committee of the House of Commons was appointed to inquire into the matter. The causes which led to the comparative failure were chiefly—(1) the absence of personal solicitation and collection of

premiums, and the necessity of a visit being made to post offices to pay the premiums, in fixed sums and on specified dates; (2) the limited number of insurance and annuity post offices, and the early hours at which they are closed for the transaction of such business; (3) the limitation of the amounts for which life insurances could be effected and annuities granted, both as regards the maximum and minimum; (4) the complicated character of the formalities which had to be gone through by those who desired to effect life assurance and purchase annuities.

With a view to the removal of most of these obstacles, a plan was suggested to the committee by Mr. J. J. Cardin, of the Receiver and Accountant-general's branch of the Post Office, for the amalgamation of the assurance and annuity business with that of the Post Office savings bank, which had proved such a wonderful success. [See SAVINGS BANK.]

The committee carefully inquired into the working of the proposed plan, and in view of the great advantages which they considered would result from it, recommended that a bill should be brought in and passed with the least possible delay to give full effect to the scheme. An Act was accordingly passed in 1882, and any person wishing to insure his life or to purchase an annuity through the Post Office, is now able to do so at any one of the nearly 7000 Post Office savings banks in the United Kingdom, where he is supplied with the form or forms applicable to his case, and such information as he may require. On the necessary preliminaries being completed (and these have been reduced to the smallest limits compatible with the safe conduct of the business) he is furnished, if he is not already a depositor in the Post Office savings bank, with a Post Office savings bank deposit book, and a deposit account is opened in his name. He then signs an authority for the transfer of the amount of all future premiums, as they become due, from his Post Office savings bank account to his insurance or annuity account. Into the savings bank account thus opened the annuitant or insurant pays such sums as he may from time to time find convenient; and the amounts thus paid, together with any accumulations by way of interest, or from dividends on stock purchased under the savings bank regulations, form the fund from which the Post Office takes the premiums as they become due. All moneys standing to the credit of the annuitant or insurant in his Post Office savings bank account, are thus available for the payment of premiums, whether deposited specially for that purpose or otherwise. So long as care is taken to have a sufficient balance in the savings bank account when the premiums become due—that is, once a year—the annuitant or insurant has no further trouble in the matter. In the event of the balance being insufficient to meet the premiums when they become due, a special notice is sent from the Post Office to that effect, and a reasonable time is allowed for making good the deficiency.

As stated above, under the Act of 1864 no annuity could be purchased in the Post Office for more than £50. The committee unanimously recommended that the maximum both for life insurance and annuities should be raised to £200; but this was opposed in the House of Commons, and the limit for both annuities and policies of insurance was fixed at £100.

ANNUITY. An annuity consists in the payment of a certain sum of money yearly, which is charged upon the person or personal estate of the individual from whom it is due. If it is charged upon his real estate it is called a rent-charge (Littl., s. 220). A sum of money payable occasionally does not constitute an annuity; the time of payment must recur at certain stated periods, but it is not necessary that these periods should be at the interval of a year.

An annuity may be created either for a term of years, for the life or lives of any persons named, or in perpetuity;

and in the last case, though, as in all others, the annuity as to its security is personal only, yet it may be so granted as to descend in the same manner as real property; and hence such an annuity is reckoned among incorporeal hereditaments.

A perpetual annuity, granted in consideration of a sum of money advanced, differs from interest in this, that the grantee has no right to demand back his principal, but must be content to receive the annuity which he has purchased.

The legislature used to require that certain formalities should be observed in creating an annuity, as that within thirty days after the execution thereof there should be enrolled in the High Court of Chancery a memorial containing the date, the names of the parties and witnesses, and the conditions of the contract. The Act 17 & 18 Vict. c. 90, for the repeal of the usury laws, having repealed the enactments in 53 Geo. III. c. 141, 3 Geo. IV. c. 92, and 7 Geo. IV. c. 75, for registering annuities, enrolment of memorials, and otherwise restricting annuity transactions, they have, in consequence, become more general, and the formalities before attended to have been entirely swept away.

Annuities may be, and very frequently are, created by will, and such a bequest is considered in law as a general legacy; and, in case of a deficiency in the estate of the testator, it will abate proportionably with the other legacies. The payment of an annuity may be charged either upon some particular fund (in which case, if the fund fails, the annuity ceases) or upon the whole personal estate of the grantor; which is usually effected by will, a deed of covenant, a bond, or a warrant of attorney. Formerly only the arrears of an annuity due at the time of the bankruptcy of the grantor could be proved on the estate, unless the annuity were secured by bond, and the bond forfeited at the time of the bankruptcy; but an annuity creditor of any bankrupt, by whatever assurance the same is secured, is now entitled to prove for the value of such annuity, which value the court shall ascertain. The value thus ascertained becomes a debt charged upon the estate of the bankrupt; and hereby both the bankrupt and his surety are discharged from all subsequent payments.

If the person on whose life an annuity is granted dies between two days of payment, the grantee has no claim whatever in respect of the time elapsed since the last day of payment; from this rule, however, are excepted such annuities as are granted for the maintenance of the grantee; and the parties may in all cases, if they choose, by agreement, provide that the grantee shall have a ratable portion of the annuity for the time between the last payment and the death of the person on whose life it is granted. On government annuities a quarter's annuity is paid to the executors of an annuitant, provided they prove the fact of the death. Annuities which are granted by government as a reward of public services, and made incapable of transfer, are called pensions.

There is an immense variety in the nature of annuities, and the terms and conditions on which they may be granted are almost endless in their diversity. Their value is also affected by the fluctuations in the value of money, and in consequence calculations of great complexity are necessary in order to estimate them. These calculations form a special province of algebraical science, which has been cultivated with great success by some of our ablest mathematicians. In every calculation, however, the two chief elements must be, first, the value of money, i.e. the amount of interest it will bring; and second, the rate of mortality.

The security of the method for estimating the value of life annuities depends upon the presumption that the average mortality of the buyers is known. This average cannot be expected to hold good unless a large number of lives be taken. Therefore, the granting of a single annuity.

or of a few annuities, as a commercial speculation, would deserve no other name than gambling, even though the prices demanded should be as high as that given in any tables whatsoever. Most of the leading insurance companies undertake the granting of annuities. Their terms, as a rule, are more favourable than those of the government, but the additional security offered by the latter is an attraction to many.

ANNULO'SA, the name formerly given to those animals which are now classed in the two subkingdoms VERMES and ARTHROPODA.

AN'NUS DELIBERAN'DI, in the law of Scotland, was the term of a year immediately following the time of the death of the proprietor of heritable property, allowed to the heir that he might make up his mind whether he would accept the succession with the burden of his predecessor's debts. The practice is adopted from the title of the Pandects, and the term of a year was fixed by a constitution of Justinian. Under the statutes of the present reign, however, the time is reduced one-half, and proceedings to attach the heritable estate of his ancestor may be taken against the heir-apparent six months after the ancestor's death.

ANO'A, a species of ruminating quadruped, belongs to the group BUEFALO. It is about the size of a sheep, and is found in large herds on the rocky mountains of the island of Celebes. It is wild and fierce; the horns are erect, straight, sharp, depressed anteriorly, and irregularly ringed at the base, and for some distance upwards.



Horns of Anoa.

ANODON. See SWAN-MUSSEL.

AN'ODYNES, medicines which are applied externally or are introduced into the body to relieve pain. When applied externally they act by rendering the nerves of the part less sensitive, and accordingly diminish the excitement which always accompanies pain. Thus the tincture of acornite mixed with a little soap liniment is sometimes used to relieve the pain caused by sciatia, and the liniments of belladonna and of opium are commonly used where there is much local suffering. When administered internally by means of the stomach, or by subcutaneous injection, they act directly upon the brain, and generally produce sleep. Hence they are also denominated *hypnotics*, and more commonly still *narcotics*. Great caution is always required in their administration, as an overdose may easily be taken, and be followed by fatal effects. The substances used as anodynes are for the most part derived from the vegetable kingdom, and their various properties will be found described under such headings as **OPICUM**, **HENBANE**, **WOODY NIGHT-SHADE**, **DEADLY NIGHT-SHADE**, and **PRUSSIC ACID**.

ANOINT'ING, as an accompaniment of feasting and rejoicing, a mode of consecration, and as a remedy in sickness, has been practised by Eastern nations from the very earliest times. The custom is frequently referred to both in the Old and New Testaments. The earliest allusion to it is found in Gen. xxviii. 18, where Jacob is described as anointing the stone he had used for his pillow, in token of the vow he had taken upon him. Very minute directions are given in Exod. xxx. respecting the preparation of the oil or ointment to be used in the consecration of the priests and the sacred vessels. The appointment of a king or ruler was always accompanied with the observance of this custom; hence the frequent description of a king as the "Lord's anointed." The term *Messiah*, or, in Greek, the Christ, which is given in Isaiah xlv. 1 to Cyrus, and in

Dan. x. and John iv. to the promised Deliverer, literally means "the anointed," and signifies one set apart or consecrated to a certain work. The custom was also observed at festivals, and fragrant perfumes were often mingled with the oil used in anointing the guests at a feast; and in reference to this the word is frequently used as a symbol of peace and happiness. The practice of anointing the sick is also a very ancient one, and is still observed in the East. It was believed to soothe pain, to close the pores of the body against noxious exhalations, and to promote health. See **CORONATION**, **EXTREME UNCTION**.

AN'OLIS, a genus of LIZARDS belonging to the Iguanian family. In this genus the toes are dilated under the last joint but one, in the form of an oval disc, beset with imbricated scaly lamellae; the skin under the throat is capable of being greatly dilated and puffed out, but when not so it hangs like a dewlap. There are two rows of teeth in the palate; no pores are placed on the thighs. The lizards of the genus *Anolis* are peculiar to America and the adjacent islands, where they appear to take in some measure the place of the *Geckos*, the structure of their toes enabling them, if not to traverse a smooth wall or ceiling, at all events to climb with great facility, as the pad beneath each toe is so constituted as to act like a sucker, and thus secure the animals more firmly as they make their way along branches of trees, or over stones; the toes, moreover, are long, and furnished with sharp hooked claws. In some species both the back and tail present a longitudinal ridge, or notched crest; in some the tail does not exhibit this character. These reptiles are slender, active, and for the most part of small size; they frequent woods and rocky places, running, climbing, or leaping with singular address and celerity; so rapid indeed are their movements, that they have been compared to those of birds flitting from branch to branch. When tired by their exertions they stop, open their mouths, and pant like a dog. They are timid and harmless, and when under the influence of fear, or when otherwise excited, they dilate the dewlap to a vast extent, and at the same time assume a succession of ever-varying hues, the tints of the skin generally, but especially of the throat, changing with greater rapidity than in the chameleon. The dewlap of the *Anolis bullaris* of the West India Islands is, when dilated, of a bright cherry red.



Anolis Vellifer.

They are often caught by boys, who take advantage of their fondness for musical sounds, arresting their attention, and then throwing a little noose over their head. The great crested *Anolis* (*Anolis vellifer*) of the same islands, though timid and very restless, is very curious, peeping from the boughs as if to watch what was going on; and so intent is it as to allow itself to be caught by means of a noose. It will also run into anares, which the children place near its haunt, alluring it from its concealment by imitating its low but shrill chirping. In this species, the body of which is a foot in length, a denticulated crest, supported by bony processes, runs down the centre of the back and the basal half of the tail.

Another species, the white-scarfed Anolis (*Anolis equestris*), inhabiting the Antilles, and equal in size to the great crested Anolis, is remarkable for a white throat and a white band passing over each shoulder and running half-way down each side.

Their food consists of insects, fruits, and berries. They do not appear to be at all aquatic, like the Iguana, which often takes to the water, and swims well.

ANOMALISTIC YEAR, the interval which elapses between two successive times when the earth is at the least distance from the sun. The anomalistic year is 365 days, 6 hours, 13 minutes, 45 seconds, and is 25 minutes less than the mean TROPICAL YEAR (our ordinary year), or 4 minutes, 39 seconds more than the SIDEREAL YEAR. The latter is the interval the earth takes to arrive at the same position in space with respect to the stars which it held about twelve months before. But the action of the other planets on the earth's orbit is such as to cause it slowly to revolve in the direction of the earth's motion, so that when the earth returns to the same position in space (sidereal year) it has yet over $4\frac{1}{2}$ minutes to travel before arriving at the same relative part of its own orbit (anomalistic year), as, for instance, the perihelion or least distance from the sun. If the earth's orbit were fixed, the anomalistic year would coincide with the sidereal. See PRECESSION.

ANOMALY, in astronomy, a term derived from the Greek ἀνόμαλος (*anómalos*), unequal or irregular, and applied in astronomy to the angle through which the radius drawn from a planet to the sun, has moved with the planet from the time when the planet was at its least distance from the sun. The term was applied to this angle, as being the angle whose irregularities were first observed; though it must be confessed that this is not a happy specimen of mathematical nomenclature.

ANONACEÆ, an order of plants consisting of tropical or subtropical trees and bushes, which usually abound in a powerful aromatic secretion, which renders the flowers and

cultivated in the West Indies and South America. Finally, the bark of some separates readily into fibres which make excellent cordage.

The Anonaceæ are readily known by the calyx of three sepals, the double corolla of six petals, the enlarged connective of the stamens, and the ruminated albumen of the seeds.

ANOPLOTHERIUM (from Gr. *an*, privative, *oplon*, a weapon, and *thēr*, a wild beast; that is, a beast without tusks or offensive arms), an extinct genus of the group ARTIODACTYLA, first described by Cuvier, and of which the fossil remains, mixed with those of the Palæotherium, occur in the gypsum quarries near Paris, in the building-stone of Binstead, near Ryde, and also in the neighbourhood of Orleans and Genoa.

These Anoplotheria are remarkable in the characters of their dentition. The teeth consist of six incisors in each jaw, two canines and fourteen molars, reckoning both sides together; and these are arranged (as in man) in a continuous and uninterrupted series, without any vacancy between the incisors and the canines, or between the latter and the molars. The feet are cloven, as in the deer or ox, and each toe is sheathed in a hoof. In Ruminants the metacarpal and metatarsal bones are blended into a single cannon bone; but in the fossil remains in question, though the feet are cloven, these bones are separated into two, and therefore do not form cannon bones. The Anoplotheria may be regarded as constituting a link between OMNIVORA and RUMINANTS. Their heads, judging from the skull, partook of the form of that of the horse and of the camel; the snout was not elongated, neither was there any proboscis. The Anoplotheria are divided into subgenera on various minor details of structure.

1. *Anoplotherium proper*.—Of this two species were described by Cuvier, one (*Anoplotherium commune*) about the size of the ass; the other (*Anoplotherium secundarium*) as large as a moderate-sized hog. These animals were low on the limbs, and were furnished with a long tail compressed horizontally at the base. It is surmised that they were, like the hippopotamus, aquatic in their habits, frequenting lakes and marshes, and feeding upon such vegetables as grow in humid localities. The flattened form of the tail indicates great powers of swimming and diving. There is a third or supernumerary hoof on the fore feet.

2. *Xiphodon*.—No additional false hoof. Inferior molars tuberculous. Cuvier described a single species (*Anoplotherium gracile*), of light and slender contour, like the gazelle; of small size, and furnished with a short tail. Its habits were probably analogous to those of some of the antelopes; it was fleet and active.

3. An additional false hoof both on the fore and hind feet. Cuvier described three species—*Anoplotherium leporinum*, about the size of a hare, *Anoplotherium murinum*, and *Anoplotherium obliquum*.

ANSBACH or **ANSBACH**, formerly *Onolzbach*, the capital of the extinct principality of that name, and now the capital of Middle Franconia in Bavaria, lies in a fertile and richly-cultivated valley, traversed by the river Rezat, and is built round the confluence of that river with the Holzbach, 25 miles S.W. of Nuremberg. The town is embellished with handsome squares, and is well and regularly built. The palace of the former margraves of Ansbach is now a picture gallery and library, and its grounds are kept in repair for the recreation of the inhabitants. Ansbach is the seat of a court of justice and court of appeal; it also contains one of the royal gymnasia or high schools, schools of design and music, and a society of arts and manufactures. The principal manufactures are earthenware, tobacco, linens, cottons, half-silken fabrics, woollens, cutlery, and white lead; considerable trade is also carried on in flax, corn, and wool. The last of the margraves, who formed a branch of



Sour-sop Tree.

leaves of many highly fragrant, and the dried fruits of others so highly aromatic as to vie with the spices of commerce. Among these last is the Ethiopian pepper, which is yielded by the fruit of *Xylopia aromatica*. Of others of this order, the fruit is succulent and abounds in a delicate juice, which renders it a pleasant article of food. Under the name of Sour-sop, Sweet-sop, and Custard-apple many kinds are

the Hohenzollern family, sold his principality in 1791 to the kingdom of Prussia, and in 1806 it was transferred to Bavaria by Napoleon I. Population, 14,195.

ANSELM, Archbishop of Canterbury in the reigns of William Rufus and Henry I., commonly called St. Anselm, was by birth an Italian, and a native of Aosta, in Italy. He took the monastic habit in 1060, at the age of twenty-seven, at Bec, in Normandy, where Lanfranc, afterwards archbishop of Canterbury, was prior. Three years afterwards, when Lanfranc was promoted to the abbacy of Caen, Anselm succeeded him as prior of Bec, and when Herluin, the abbot of that monastery, died, Anselm became abbot of the house. Anselm came to England about A.D. 1092, by the invitation of Hugh Lupus, earl of Chester. Soon after his arrival William Rufus nominated him (though with great difficulty of acceptance on Anselm's part) to the see of Canterbury, which had lain vacant from Lanfranc's death in 1089. Anselm, having first stipulated for the restitution of the possessions of the see as they had stood in his predecessor's time, was consecrated, with great solemnity, 4th December, 1093. In the following year a quarrel arose between Anselm and the king, in consequence of the determination of the archbishop to proceed to Rome to receive the pallium (sacred mantle). The king refused to give him leave to go, but Anselm persisted, and as soon as the king had ascertained that Anselm had crossed the channel, he seized upon the archbishopric, and made every act of Anselm's administration void. The archbishop was honourably received by the pope.

Henry I., immediately upon his accession, invited Anselm to return to England, but fearing his brother Robert's arrival as a competitor for the throne, he was crowned by another prelate. The archbishop was received in England with extraordinary respect both by the king and people, but refusing to be re-invested by the king with the pallium of office, and to do the same homage as his predecessors, he again fell under the displeasure of the court. This continued for a long time, notwithstanding which he promoted the marriage of Henry with Matilda, eldest daughter of Malcolm, king of Scotland, though she was reported to be a nun, and afforded him assistance in other affairs. Anselm now retired to Lyons, withdrawing from the strife of the king and the pope over the right of investiture; that is, practically, the right of nominating to the highest offices of the church. Eventually he removed from Lyons to the court of Adela, countess of Blois, the king's sister, who, during a visit which Henry I. made to Normandy, contrived an interview between him and Anselm, 22nd July, 1105, at the Castle of l'Aigle, when the king restored to him the revenues of the archbishopric, but refused permission for Anselm to return to England unless he would admit the king's right of investiture. Anselm, still refusing, remained in France, and retired to the abbey of Bec; and though the English bishops, who till then had sided with the king, now changed their minds, and pressed Anselm to return, he refused. At length the pope adopted a middle course, refusing to give up the investiture, but agreeing to dispense with it so far as to give leave to bishops and abbots to do homage to the king for their temporalities. This was in 1106. The king now invited Anselm to England, but the messenger finding him sick, the king himself went over into Normandy, and paid him a visit at Bec, where all their differences were adjusted. Anselm, having recovered, embarked for England, and landing at Dover was received with extraordinary marks of welcome. From this time little that is remarkable occurred in the life of Anselm, excepting a dispute with Thomas, elected archbishop of York in 1108, who, wishing to disengage himself from dependency upon the see of Canterbury, refused to make the customary profession of canonical obedience. Before

the termination of this dispute Anselm died at Canterbury, 21st April, 1109, in the seventy-sixth year of his age.

Though he rendered great service to the church by the bold stand he maintained for its independence and authority, and by his earnest efforts for the reform of the clergy and the improvement of the monasteries, it is upon his work as a scholar and theologian that his fame chiefly rests. Animated by a devout and reverent spirit, he possessed also a powerful and vigorous intellect; and from the great ability displayed in his attempt to establish a religious philosophy, he has been termed the Augustine of the middle ages. His writings have exercised a powerful influence over Christian theology—an influence that has not yet passed away. The theory of the atonement propounded by Augustine and developed by Anselm, is still accepted by most of the reformed churches. [See ATONEMENT.] He was also the first to propound and maintain the famous *a priori* proof of the being of God, which has been so largely debated in metaphysical theology.

The works of Archbishop Anselm were published first at Nuremberg, folio, 1491; at Cologne in 1573 and 1612; at Lyons in 1630; by Father Gerberon, at Paris, in 1675, reprinted in 1721; and again at Venice, 1744, in two volumes folio. In the library of Lyons there is a beautiful manuscript of his meditations and prayers. Some of the pieces in the Cologne edition of 1612, and the Lyons edition of 1630, are thought to be spurious.

Anselm was the first who restrained the marriage of the English clergy, by passing the ecclesiastical canons of the years 1102 and 1108. The canonization of Anselm took place in the reign of Henry VII.

The latest and best account of the struggle between Anselm and William Rufus is contained in Mr. Freeman's "William Rufus" (Oxford, 1882), a work of great research and at the same time of absorbing interest. The best life of St. Anselm is that by Martin Rile (London, 1884).

ANSERES is an order of BIRDS which, though including such different birds as the albatross, the pelican, the penguin, and the common duck, yet present an agreement in the following general characters. The legs are short, and are placed far back towards the tail. Though this renders their gait upon land very ungainly, it is admirably adapted for their aquatic habits. The body is stout and bulky, of a boat-like form, and is thickly covered with a coat of down which not only serves to protect the birds from the changes in temperature to which they are exposed, but is rendered impervious to water by being constantly lubricated by means of the oil-gland possessed by them. In all this order the toes are webbed; but it is only in the pelican family, the frigate-bird, and the tropic-bird that this web or membrane extends to the hind toe.

In some other respects the Anseres present many important differences amongst themselves. The wings, which in the penguins are devoid of quills, and are mere paddles, in the albatross often cover a space of 15 feet, and support the bird in the air for an extraordinary length of time. In the duck family and the flamingo, which together comprise the Lamellirostres, the bill is flat and horny at the extremity, the edges are furnished with "lamellæ"—small plates through which the bird strains the mud and water it has taken up with its food. The pelicans have an enormous distension of the skin below the bill, which serves them as a pouch or fishing bag.

All the Anseres are aquatic in their habits, and they display none of that art of nest-building so common among birds, their nests being often simply a hole scratched in the earth. Their food consists of fish, snails, worms, seaweed, grass, &c. The male usually lives with several female birds. The young of most of the members of this order, even when just hatched, are able to get food for themselves without the assistance of their mother.

The *Anseres* are divided into four groups. The first is *Lamellirostræ*, in which the edges of the bill are furnished with small plates. The most important of these are the flamingo, swan, goose, cormorant, duck, teal, and geosander. The second group is *Steganopoda*. In these all the toes are webbed. Amongst them may be mentioned the gannet, darter, pelican, cormorant, frigate-bird (see Plate I., *ANSERES*, fig. 1), and tropic-bird (fig. 2). In the third group, *Longipennes*, the hind toes are not united by a web, and the wings are long. Of these the most interesting are the gull (fig. 3), petrel (figs. 4 and 5, Plate II.), albatross and skimmer (fig. 6). The last group, *Pygopoda*, have very short wings, and in some cases no hind toe. This group includes the grebe (fig. 7), razor-bill, puffin (fig. 8), great auk, and penguin.

ANSON, GEORGE, LORD, was the third son of William Anson, a gentleman of a good family, long established in Staffordshire. His inclination for a seafaring life developed itself early. In 1722 he was made master and commander of the *Weasel* sloop, and the year following was raised to the rank of post-captain, and to the command of the *Scarborough* man-of-war.

It was at the breaking out of the Spanish war that he first became an historical character. In 1740 he was appointed to the command of a small squadron, which was ordered to sail for the South Sea, a quarter where no attack was anticipated, to harass the coasts of Chili and Peru, and to co-operate occasionally with Admiral Vernon across the Isthmus of Darien. The scheme was well laid, but frustrated by unaccountable delays in the first instance, and afterwards by some unforeseen accidents. He doubled Cape Horn in March, 1741, after experiencing most tempestuous weather off that dangerous coast, in which his whole squadron was dispersed. With what feeble remains he could collect he left Juan Fernandez in September, kept the Spanish coast for eight months in continual alarm, made prize of several small vessels, and burned the town of Paita. The original design of the expedition being frustrated, he conceived the project of intercepting the Manila or Acapulco galleon, a Spanish ship laden with bullion and other valuables to a vast amount, which sailed annually between Acapulco, in Mexico, and Manila, one of the Philippine Islands. With this view he hovered on the west coast of America till May, 1742, when he set sail to cross the Pacific Ocean. After a cruise to China, Anson resumed his design of intercepting the Spanish galleon, and steered his course back to the Straits of Manila. He met and took her after a short but sharp engagement, 20th June, 1743. The prize was mounted with forty guns, manned by 600 sailors, and laden with treasure and effects to the value of £318,000. He returned to China for the purpose of selling her, and thence proceeded round the Cape of Good Hope to England, and arrived at Spithead in safety, 15th June, 1744.

Soon after his return Anson was appointed rear-admiral of the Blue, and one of the lords of the Admiralty. In 1747, being in command of a powerful fleet of fourteen ships, he fell in with two combined French fleets, bound to the East and West Indies, laden with merchandise, treasures, and warlike stores, protected by a strong convoy. On this occasion he captured six ships of war, not one escaping, together with four armed East Indians. For his signal services George II. rewarded him with a peerage, by the title of Lord Anson, Baron of Soberton, in Hants. In 1761 he was appointed first lord of the Admiralty, in which station he continued, with a very short interval, till his death, which took place 6th June, 1762, in his sixty-fifth year.

ANSTRUTHER, Easter and Wester, two small royal burghs in Fifeshire, Scotland, comprised in the St. Andrews district, are situated on both banks of the mouth

of a small stream which falls into the sea on the east coast. They are both fishing towns. Easter Anstruther has one good street, and a harbour, about 7 acres in extent, constructed by the Scotch Board of Fisheries. Population, 1849. Wester Anstruther has a population of 594. Its harbour does not admit ships. Easter Anstruther was the birthplace of Dr. Chalmers.

ANSWER (in fugue), the repetition in one part of the harmony of a musical theme proposed in another part, according to certain strict rules. See CANON, IMITATION, FUGUE.

ANT is a popular name given to three distinct groups of insects, one group being only distantly related to the other two. There are social ants (*Heterogyna*), solitary ants (*Mutillidæ*), and white ants (*Termitidæ*). The social and solitary ants belong to the order *HYMENOPTERA*, in which the veins of the wings are few and branching; the abdomen of the female is furnished with an *ovipositor* (egg-placer), or with a modification of this—a sting; the larvæ have no feet, they are inclosed in cells, and food is provided for them; the pupa is inactive. The *NEUROPTERA*, to which the white ants belong, have net-veined wings; there is no ovipositor or sting; the larva has six legs; the pupa resembles the perfect insect, and is active in some—e.g. the white ants. The social ants, as the name implies, live in communities, and they differ also from the solitary ants in having a special class of undeveloped females, the so-called "neuters," whose function is to work and fight. The fore-wings are not doubled when at rest, and the stalk which joins the abdomen to the thorax has one or two projecting scales or lumps—two in the *Myrmicidæ*, and one in the *Poneridæ* and *Formicidæ*. The last-named family have no sting. In *Dorylidæ*, only the first segment of the abdomen forms the stalk.

The inhabitants of an ant-nest consist of males, females, and workers, or neuters, besides eggs, larvae, and pupæ. The workers never acquire wings, while the males and females possess during the pairing season. The females may be distinguished by their superior size. Two forms of workers occur in many genera—one with a large head, the soldier; the other with a head of the usual size, the worker proper.

If in the month of August or September an ant-nest be watched on some hot day, thousands of winged ants will be seen issuing forth, rising in the air with a slow movement, and settling on gates, stones, and posts. These are the males and females which have recently emerged from the pupa state and attained their complete development. They often appear in astonishing clouds, which resemble wreathing columns of vapour. It is now that the males and females pair, and were it not for the destruction that takes place among the females, ants would perhaps become the pests of the land. In some of the tropical countries their ravages are notorious. With respect to the males, after pairing they perish; they have neither sting for defence, nor strong jaws for needful labour and the acquisition of food. The females are destined to found fresh colonies, and to replenish that from which they issued; but they do not appear to be voluntary agents; they lose their wings; numbers are captured by the working ants, which during the pairing time have scattered themselves abroad, and they are reconducted to the nest, even by force, and vigilantly guarded; others are laid hold of by straggling parties of workers, who commence small colonies on their own account; but others escape, form a cell for the reception of their eggs, and thus found colonies without assistance. Multitudes are the prey of birds, or are driven into lakes or rivers. There are generally several in a single nest, each attended by workers, who supply their wants.

According to the famous observations of Huber of

Geneva ("Traité des Mœurs des Fourmis Indigènes"), the minute eggs laid from time to time by the females are of different sizes, shades, and forms; they are not, when laid, glued to any fixed place, but are carefully collected and moistened by the workers (a plan which seems essential to their development), and laid in heaps in separate apartments, or carried from one to another as they may require a warmer or moister situation, or as the weather may render needful. In a few days the young grubs are disclosed, and require the most unremitting care. Not only have they to be fed, but to be removed to different ranges of cells, deeper or more superficial, according to the state of the weather, the temperature of the atmosphere, or the time of day. The devotion of the workers to the helpless larvæ is indeed extreme, and they spare neither labour nor their own lives in the protection of their charge. The larvæ of most species when fully grown envelop themselves in a cocoon of silk, and so assume the pupa state; still they require the same attention as previously, while other eggs and larvæ at the same time demand the services of their attendants. During all this time the settlement has to be kept clean, and to be repaired; fresh additions have to be made, and food has to be brought in. The workers know the precise moment when the young ant, inclosed in its shroud, requires their aid in effecting its liberation. Three or four mount the cocoon and carefully open the silken envelope where the head lies, and gradually extract the prisoner. It is still inclosed in a thin pupa case, and from this they next cautiously liberate it, clearing the wings of the males and females, and the limbs both of these and the workers. Mr. F. Smith, in his British Museum Catalogue (*British Fossorial Hymenoptera*), states that he has observed that some of the pupæ which he had deprived of assistance, were able to free themselves from their pupa-cases. The new-born brood is still watched and fed till the workers acquire strength and intelligence, and the males and females are quite ready to take wing. In the case of a single female founding a colony, all the duties of attending to the larvæ devolve upon herself, unless she can attract a few stray workers to assist her. Her first food consists, however, mostly, if not exclusively, of workers, which are soon able to relieve her of all toil for the future. The larvæ are fed by means of a fluid disgorged from the stomach of their nurses.

In the tropics vast armies of ants are often seen crossing the country. They march in dense columns, and nothing stops their course; they carry buildings by storm; they climb over walls or undermine them; and should a river oppose their progress, they perseveringly endeavour to cross, though millions perish in the attempt.

The food of ants is various, and consists alike of animal and vegetable substances. They are extremely partial to saccharine matters and to ripe fruit; but in our country and the adjacent parts of the Continent they do not hoard up provisions, as they pass the winter in a state of comparative torpidity. They are very fond of the saccharine excretion (honey-dew) of various species of Aphis; in fact, these Aphides are their milch cattle, which willingly render to them their liquid honey. Some ants even make cells of clay round their Aphides, leaving a hole only just big enough to admit themselves, but not large enough for the Aphides to escape. Sir John Lubbock has confirmed Huber's observations of the solitude with which ants tend the eggs of Aphides. The Aphis in the case observed was the one to be found on the daisy. Their eggs are laid early in October in the axils of the leaves of the plant. They are of no direct use to the ants, yet they are not left where they would be exposed to the severity of the weather and to innumerable dangers, but are collected by the ants and brought into their nests. Here they are tended with the greatest

care through the long winter months until the following March, when the ants bring out the young Aphides, and place them to browse on the then young shoots of the daisy. This is certainly a most remarkable case of prudence and forethought. Though English ants do not lay up food for the winter, they do yet more, for they keep during six months a store of eggs which will enable them to procure their food during the following summer. Besides Aphides ants also keep for the same purposes gall-insects, scale-insects, and caterpillars of the genus *Lyceena*.

Amongst some kinds of ants, certain of the workers act as living honey-jars. They receive the honey from the foragers in such quantity that their abdomens become enormously distended, and they disgorge it again according to the wants of the community. Weismael and M'Cook have described one (*Myrmecocystus mexicanus*), an inhabitant of Mexico and Colorado, and Sir J. Lubbock another (*Camponotus inflatus*) which lives in Australia.

Latreille, in his elaborate work on ants ("Histoire Naturelle des Fourmis"), Huber of Geneva, and other naturalists, who had carefully studied their habits, denied that ants ever stored grain, and offered as an explanation of the popular belief, the circumstance that when an ant-nest is opened the workers are seen carrying off into inner recesses grain-like bodies, which, however, on examination prove to be, not seeds, but the grain-like cocoons. This appeared remarkable in face of the explicit statements of the ancients, and received considerable modification as reports came in from India, South America, and elsewhere, of the actual existence of grain-storing ants. In 1873 Mr. Moggridge published a memoir, "Harvesting Ants and Trap-door Spiders" (and in 1874 a supplement), giving the result of some months' observation at Mentone. He found that some ants certainly do store seed, but not more than two species out of 104 which inhabit Europe—namely, *Atta barbara* and *Atta structor*—and these only in southern Europe. But these two species are exceedingly common on the shores of the Mediterranean, and are much more conspicuous than other kinds from their habit of moving in long trains, and because they are almost as common in the streets of a city as in the open country. These ants are seen to collect seeds of all kinds; and that their object was to provide food, and not building material, seemed probable from the rubbish-heaps outside their nests containing the outer husks of grass-seeds. If building material were the requisite, the husks would have been of considerable value in increasing the toughness of the seeds. This was confirmed on opening the nests by finding that the grains were not scattered, but collected into suitable "granaries." It is a very remarkable fact that although these seeds are kept moist, and stored underground, it is exceptional to find any of them sprouting. After a shower of rain the ants carry them out to dry in the sun, and bite off the rootlets of those that have germinated, thus preventing further growth. Mr. Moggridge planted seeds taken from the granaries, and found that they began to grow at once; and observed further that, where ants had been cut off from their nest, all the stored seed sprang up; thus proving, it would seem, that it requires daily attention on the part of the ants to keep them from growing and becoming worthless. At the instance of Mr. Darwin he made several experiments with the hope of finding out the means employed by the ants, but in this he did not succeed. The coats of most seeds are too tough to be pierced by ants, and it is only when the rootlet pushes its way out through the skin that the ants can penetrate to the soft interior. Moreover, the inside of a seed which has not begun to sprout is refused, whereas a sprouting one is eaten greedily. It is well known that when seeds germinate their starch becomes changed into sugar in order

to nourish the young cells which are undergoing rapid growth; and advantage is taken of this change in the malting of barley. Judging from all these facts, it would appear that the ants use seeds as food just at that particular time when full of sugar, and that they are able to preserve them, and make them undergo this change according to the supply needed. Those harvesting ants do not keep Aphides, nor make use of them when they find them. Dr. Lincecum described (*Journ. Linn. Soc.*, 1861) the habits of an "agricultural ant" of Texas (*Atta barbata*), which makes its nest where a particular rice-like grass flourishes. To insure a good crop these ants destroy all other herbaceous plants for some distance round, and when the grain is ripe they gather in the harvest.

Mr. Belt, in his "Naturalist in Nicaragua," has noted remarkable facts which show the existence of a mutual dependence between certain trees and species of ants; and Mr. Fritz Mueller in Brazil, and Mr. Francis Darwin at home, have made further contributions on the subject. The trumpet tree of America (*Cecropia peltata*) is inhabited by a species of ant (*Pseudomyrma bicolor*) which make their nests in the naturally hollow trunk and branches. At certain spots in the branches (towards the upper part of each internode) there are small depressions where the bark is vulnerable. When the winged female ant alights on the tree to lay her eggs and found a colony, she makes a hole at one of these spots, and takes up her abode in the hollow cells of the interior. The tree then exudes a juice at the wound, which shuts her in from attack, and after a short time the workers emerge from their pupa state, eat their way out, and begin to hunt for food. Scale-insects (*Coccidæ*) feed on the juices of these trees, and by exuding drops of "honey-dew," supply a sugary food. At the base of the stalk of each circular leaf there is a cushion of hard hairs, and from among these spring up, just when the leaves are bursting, a multitude of white pear-shaped bodies, the very proteinaceous food which the ants need in addition to the sugar. Ants are thus not only attracted to the trees, but there is no temptation to leave them. The gain, however, is not all on the side of the ants, for the trees could scarcely exist if it were not for the protection these ants afford by preventing with their powerful stings the invasion of another kind of ant (*Ecodoma cephalotes*), which cause great devastation by stripping trees of their leaves. Travelers often meet long trains of these ants, each bearing a leaf to deposit in their earth-nests, and the question incidentally arises, Why do the ants take the trouble of collecting leaves? Mr. Belt has examined the nests, and believes that the ants live on a fungus which grows on the damp leaves. Another tree attacked by these leaf-strippers is the bull's-horn thorn (*Acacia sphaerocephala*). The leaves are of the ordinary acacian form, and at the points of each of the lower leaflets are small, yellow, pear-shaped bodies, supplying the ants which defend them from the leaf-strippers with proteinaceous food. The needful sugar is produced in this case by the plant itself in a "crater-formed" gland or nectary in each leaf-stalk, while the hollow thorns (shaped like bulls' horns) are used as nests. Professor Caruel (in the *Nuovo Giornale Botanico Italiano*, 1872) gives another very striking instance of the relations that exist between ants and members of the vegetable kingdom. The *Myrmecodia tuberosa*, a small herbaceous plant, one of the Cinchonæ, grows only upon trees. The berry is eaten by birds, and the undigested seed passes through and adheres to the branch of a tree. It germinates there, and grows to the length of about one-fifth of an inch; and then its life untimely ends, unless an ant intervenes, and gives it a friendly bite at the root-end. This has an effect on growth somewhat similar to the puncture of a gall-fly. The root-end becomes tuberos,

and as it grows the ants make passages and take up their abode in it, while the tuber, in consequence of this interference, constantly enlarges, and the plant grows, flowers, and forms its fruit.

Of carnivorous ants the best known are the foraging or army ants (Eciton), of Central and South America. They hunt in disciplined troops, and so powerful are they in combination that even an animal as large as the opossum is attacked and devoured.

The modes in which ants construct their cities differ considerably. The red ant, for example (*Myrmica rubra*), which is common in gardens, makes burrows and chambers under stones, or in the ground under roots. The sanguinary ant, common on the Continent (*Formica sanguinea*), makes a subterranean city, composed of galleries and chambers, excavated in the earth or clay to a considerable depth. Over their covert ways into this labyrinth is placed a thick coping of dry heath twigs and grass stems. The nest of the fallow ant or wood ant (*Formica rufa*), a large species not uncommon in woods and pleasure grounds, presents a rude appearance. Externally it looks like a hillock of earth, intermixed with bits of dried twigs, straws, particles of leaves, and as we have seen, even grains of corn, all mixed together, and forming a large coping or protection to numerous chambers arranged in separate stories, some deeply excavated in the earth, others near the centre or even the surface of the hillock; all communicating with each other by means of galleries; various passages being closed or left free according to the state of the weather. The colonies of the jet ant (*Formica fuliginosa*) make their habitations in the trunks of old oaks or willows, in which with their strong mandibles they work out horizontal galleries separated from each other by thin partitions, and all communicating with each other. These excavations often resemble halls supported by multitudes of pillars, rising story above story, and built of ebony, for the wood is invariably stained black in consequence of the action of the formic acid, a peculiar secretion found in ants, and which, dissolved in water, serves the purposes of vinegar in Norway, where the ants are collected and steeped in boiling water, and thus is formed diluted formic acid. With respect to the ants of hotter climates, the wonderful structures which they make have attracted the notice of most travellers. Some rear huge mounds; some construct large edifices in the forks of trees; some glue leaves together so as to form a purse; some excavate the branches of the trees, working out the pith to the extremity of the slenderest twig.

Ants of the same or of different species often assail each other when they meet during their foraging excursions; but besides these individual skirmishes, pitched battles are sometimes fought betwixt rival colonies, in which thousands of combatants are engaged, and the carnage is great in proportion. But what is more extraordinary, there are certain ants common on the Continent, viz. the amazon ant (*Formica rufescens*) and the sanguinary ant (*Formica sanguinea*), which make war on ants of different species, viz. the dusky ant (*Formica fusca*) and the mining ant (*Formica cunicularia*), not merely for the purpose of gratifying a propensity to combat, but to make slaves of the vanquished to do the drudgery at home, of which they are themselves, at least as far as the amazon is concerned, incapable. They proceed to the devoted colony in battle array, and are certain to prove victorious. They do not capture the adults, but the eggs and larvae. These are carried off to their citadel in triumph, and committed to the care of slaves of their own species, themselves in due time to work for their conquerors and rear up fresh supplies of captives. These slaves are really the preservers of the colony, the neuters of which—those of the sanguinary ant excepted—are fitted only for fighting. Thus a colony of amazon

ants requires the assistance of another species to act as servants or bond-slaves, who are essential to the very existence and continuance of their captors, whose young they nurse and for whom they forage for food, whose habitations they repair or enlarge, and whose comforts depend upon their exertions.

Sir John Lubbock for some years carried out a series of most interesting experiments with ants, the results of which are given in his very interesting work, "Ants, Bees, and Wasps" (1882). One remarkable fact is that the different species have strongly contrasted moral characteristics. Some are distinguished by bravery, some by cowardice, some are most industrious, some are strikingly idle. It appears that although one ant can communicate simple notions to another, it cannot communicate a more complex one. Sir John considers that ants are very stupid as regards locality. He tried putting a store of food to be reached by passing over little cardboard bridges, and he found that slightly shifting a bridge baffled them. They never tried to push the bridge, or even to make use of a supply of fine mould put ready for them to fill up the gap. In some cases he arranged a route, and then altered a bridge so that a slight jump of about a third of an inch was made necessary. They preferred going a circuit of 18 feet rather than take this small jump. On the whole, his observations seem to show that the world of ants, while a very industrious, very prudent, and in some respects a very highly and economically organized world, is rather a world ruled by averages, in which what has been called "the individuality of the individual" is not of much account. There is clear economy of labour; in the time of comparative torpidity, when there are no larvae to be fed, two or three ants do the foraging for a whole nest, coming out usually about twice a day. If these foragers were imprisoned, then an equal number were sent out in their places by the community at home; and so again if these last were imprisoned. Many experiments had for their object the throwing of some light on the power of communication possessed by ants. It is unquestionable that if an ant discovers a store of food her comrades soon flock to the treasures, although this is not invariably the case. It has been urged that this fact taken alone does not prove any power of communication. An ant observing a friend bringing food home might infer, without being told, that by accompanying the friend on the return journey she might also participate in the good things. This argument has been met by Sir J. Lubbock's compelling the ant who found the treasure to return to the nest empty-handed. If she took nothing home, and yet others returned with her, he argues, there must have been some communication between them. Further experiments, however, proved that they are not able to communicate the precise locality, for when he took away an ant which had brought out others to get the food, these wandered about without being able to find it. As the result of these experiments he concludes that ants are in possession of something approaching to a language—that they are able to ask their friends, when occasion requires, to come and lend them a helping hand. His observations on their recognition of relations are very surprising. Young ants reared from eggs taken from a nest were, when they reached maturity, introduced to the maternal abode, and although the old ants could never have seen them until that moment, yet in all the cases they were undoubtedly recognized as belonging to the community; a stranger ant is invariably at once attacked and killed. He then went further and divided a nest into two, before the queen ants had laid their eggs. Twelve months later the perfect insects were developed, and when transferred from one nest to another were at once received as friends. In some unexplained way, therefore, they recognize blood-relations. McCook experimented

on ants engaged in a battle. He transferred them to a glass jar half full of earth, and dropped among the combatants a paper pellet soaked in eau-de-cologne. This had an immediate effect; those who a moment before had been in deadly strife now peacefully set to work to dig galleries and form a nest. This experiment, which points towards recognition by means of odour, did not succeed when the ants were not actually fighting—for instance, in the case of an ant put into a strange nest, both being scented.

The very important physiological fact seems proved by some of Sir J. Lubbock's observations that "when worker ants lay eggs these always produce males." When a queen was introduced into a queenless nest she was at once attacked and destroyed; it would seem as if ants which had been long living in a republic could not be induced to accept a queen. As to their longevity, some of his ants have attained the considerable age of nearly nine years.

Sir J. Lubbock made experiments in order to determine whether ants have the power of distinguishing colours. It is a well-known habit of ants, when their nest is uncovered, to carry the larvae and pupæ away from the light. Sir John placed some ants with larvae and pupæ between two plates of glass, leaving just room enough for the ants to move freely. If any opaque substance was placed on the glass the young were always carried to the dark spot. If pieces of pale yellow and deep violet glass were used instead of the opaque substance, the ants preferred placing the young under the yellow rather than under the violet, though to our eyes the yellow is much more transparent. This and other experiments showed that colours do not present the same appearance to ants as to us. Attempts were now made to determine how far their limits of vision are the same as ours. We all know that if a ray of white light is passed through a prism it is broken up into a beautiful band of colours—the spectrum. To our eyes this rainbow band is bounded at one end by red, and at the other by violet. But a ray of light contains, besides the rays visible to our eyes, others which are called heat rays and chemical rays. These, so far from falling within the limits of our vision, extend far beyond it—the heat rays at the red, the chemical rays at the violet end. To test the effect of the chemical, or, as they are better termed, the ultra-violet rays, he placed over parts of a nest flat-sided glass bottles containing sulphate of quinine and bisulphide of carbon, both of which transmit all the visible rays, and are therefore perfectly colourless and transparent to us, but which completely stop the ultra-violet rays. Over another part of the nest he placed a piece of dark violet glass, and found that in every case the larvae were carried under the liquids; but if they had to choose between the ultra-violet and red, they preferred to place their young under the latter. It would seem, then, that the ultra-violet rays appear to the ants as a distinct colour, of which we can form no idea, but as unlike the rest as green is from violet. Probably also white light contains for them this additional colour. At any rate, as few of the colours in nature are pure colours, but almost all arise from the combination of rays of different wave-lengths; and as in such cases the visible resultant would be composed not only of the rays which we see, but of these and the ultra-violet, it would appear that the colours of objects and the general aspect of nature must present to them a very different appearance from what it does to us. As regards hearing, no sound however loud or shrill appears to have any effect, neither do ants emit any sound which can be detected even with the microphone.

The solitary or velvet ants are more nearly related to the sand wasps than to the social ant. They have no special class of workers. The male has spikes or teeth on

the tip of the abdomen; the fore-wings are not doubled; the compound eyes are kidney-shaped, and the *ocelli* (small simple eyes) are three in number. The females have neither wings nor ocelli; they have a powerful sting, and spinous legs admirably adapted for digging. These ants are parasitic in the nests of other insects. The female of the common European species, *Mutilla Europæa*, may often be seen running about in sandy places. It is a large, hairy, red and black ant, about two-thirds of an inch long. M. Drewsen, a Danish naturalist, has described how he found a humble-bee nest inhabited by this species, and the larvæ of the ants shut up in the cells of the full-fed grubs, upon which in due time they would feed.

The termites or white ants are chiefly confined to the tropics; some few species, however, extend into the temperate regions. The termites are composed of three kinds of individuals—males, females, and neuters. The last consist of two distinct classes—the workers and the soldiers. The males and females have four large transparent wings, the second pair being rather smaller than the first. At the beginning of the rainy season they leave their nests in myriads and pair. They then shed their wings and fall to the ground. So eagerly are they sought after by birds and other enemies that very few couples escape being devoured. The survivors are carefully sheltered by the workers, and become the kings and queens of new colonies. They are much larger than the workers and soldiers, and are kept in close confinement—the doors of their cell being too small to permit the egress of either. The fecundity of the female is marvellous; she will lay 31,000,000 eggs in a year, and during pregnancy her abdomen swells to such an extent as to be 2000 times as large as the rest of her body. The soldiers number only about a hundredth part of the community. They are twice as long and weigh fifteen times as much as the workers. Their heads are horny and much larger than their bodies; their mandibles are larger than those of the workers, and more adapted for weapons of warfare than for implements of labour.

Their habitations are constructed with wondrous skill. These termitaria, as they are called by naturalists, are conical mounds surrounded by cones decreasing in size as they recede from the central mass, and are formed of earth worked into a hard compact mass. They are strong enough to bear the weight of a man. These mounds attain a height of 5 or 6 feet. The entrance is at a considerable distance from the mound, and is connected with the interior of the abode by underground passages. Each termitarium consists of a vast number of cells and connecting galleries, formed of clay or particles of vegetable matter glued together with the saliva of the workers. On a level with the ground, and in the centre, is the palace of the royal couple; the chambers encircling the royal apartment are inhabited by the workers and the soldiers; while the outer cells serve as storehouses, which always contain an abundant supply of provisions. The egg-cells or nurseries are supported upon pillars, which rest upon the royal cell. Above the nurseries there is a large hollow space about one-third as large as the whole middle cone, which not only serves to ventilate the nurseries but also lowers the temperature of the whole of the interior. The nests of some species are altogether subterranean; others are fixed to branches, or are in the hollow trunks of trees. These last are the pests of houses, destroying everything not specially protected. The accounts of the destruction caused by the termites would be incredible, were they not too well attested to be doubted. They will eat into the hardest substances, particularly wood, which seems to be a favourite article of diet with them. Stanley, the discoverer of Livingstone, relates that on one occasion upon examining certain stores he found

that these insects had not only devoured the box in which the guns were packed, but had even eaten the gun-stocks. In dwelling houses the utmost care has to be taken to guard against their depredations. Bed-posts and the legs of tables and chairs are placed in vessels containing water. Nothing to which they can gain access escapes their voracity. Boots, shoes, and the contents of trunks, if left upon the ground, are destroyed in a single night. They always leave a thin shell of the object attacked, so that detection is impossible; and curious stories are told of the manner in which articles of furniture, &c., which have been operated upon by these invisible destroyers, have fallen to pieces on the slightest touch.

ANTA'CIDS (from the Greek word *anti*, against, and the Latin word *acidus*, acid) signify medicines used to correct acidity in the stomach. Though acids are present in a free state in the stomach during the process of healthy digestion, yet, under particular circumstances, they are apt to be generated in excess. Acids are also occasionally evolved in the stomach, probably from the fermentation of vegetables and fruits of different kinds, or indigestible foods. The most frequent source of acidity is that first mentioned, the secretion of acid by the vessels of the stomach. It is, therefore, dependent upon constitutional causes, or the state of the system generally.

The medicinal means of remedying this state are all alkaline, either the pure alkalies, or some combination of them—such as solution of potash, or carbonates and bicarbonates of sodium, potassium, magnesium, ammonium, or lime. The most powerful, however, are the acetates, tartrates, and citrates of the same bases, since these acids in combination with alkalies take up in the blood more oxygen, forming carbonic acid, which in turn unites with the alkalies to form bicarbonates, so that alkalization of the blood is effected without the gastric troubles which direct administration of caustic or carbonated alkalies is apt to cause. The acetate of potassium is exceedingly beneficial in cases of acute rheumatism.

ANTÆ were square pillars, continuing the line of the side walls of a temple under the portico, and assisting to support the latter with the regular columns. A temple so built is said to be *in antæ*. In classical Greek works, and in the best Roman works, antæ and pilasters are never either diminished or fluted. See figs. 5 and 6 of Plate ARCHITECTURE for an example of this construction.

ANTÆUS, one of the characters of Greek mythology. He was the son of Poseidon (Neptune) and Gaia (the Earth), and was of gigantic strength and stature. So long as he touched his mother Earth he remained invincible. Hercules, discovering this, vanquished him by strangling him in mid-air.

ANTAL'KALIES (from *anti*, against, and *alkali*) are means of counteracting the presence of alkalies in the system. Such remedies consist of the various mineral and organic acids, but they should only be taken under medical advice and authority.

ANTANANARIVO' or **TANANARIVO'**, the capital of Madagascar and seat of the government, is situated in the centre of the island, on a hill 7000 feet above the sea level. It is 190 miles W.S.W. of Tamatave, the chief seaport, the approach from which is by no means easy; but notwithstanding this, considerable trade is carried on. There are manufactures of gold and silver chains, guns and other weapons, pottery, silks, mats, &c.; also factories for oil, soap, and sugar. Iron mines are worked 20 miles distant. The inhabitants, who number 80,000, have shown themselves amenable to the elevating influences of missionary enterprise. The climate is temperate and healthy.

ANTARCTIC CIRCLE. See ARCTIC CIRCLE.

ANTARCTIC SEA, or Southern Ocean, is a term often applied by geographers to the extent of water south

of the Atlantic, Indian, and Pacific Oceans, and not merely confined, as might have been supposed would have been the case, to the sea contained within the limits of the Antarctic Circle. In this view the Antarctic Ocean's northern limit may be conveniently divided into three straight lines—the first between Cape Horn, in South America, and Cape Agulhas, in Africa; the second between Cape Agulhas and the southern extremity of the Auckland Islands as an appendage of New Zealand; and the third between the southern extremity of the Auckland Islands and Cape Horn. For further information relating to the Antarctic Ocean and Antarctic Regions see SOUTH POLAR COUNTRIES.

ANT-EATERS (Edentula of Owen) belong to the order EDENTATA, and comprise the Myrmecophagidae or hairy ant-eaters of South America, the Manidae or pangolins of Asia and Africa, and the Orycteropus or aard-vark of South Africa. This article treats only of the first group, the true ant-eaters; articles on PANGOLINS and AARDVARK will be found under those headings.

The *great ant-eater* or *ant-bear* (*Myrmecophaga jubata*) is the *tamandua* of the Portuguese and *tamanoir* of the French. In this large toothless animal, a native of Guiana, Brazil, and Paraguay, the head is narrow, with an extremely slender elongated snout, the mouth being a small slit at the extremity. The tongue is long, cylindrical, and extensible; it is lubricated by a viscid saliva, and is an efficient instrument in the acquisition of insect food. The eyes are small and deeply set, with a naked eyelid; the ears are short. The body is robust, and the limbs extremely muscular; they are furnished with huge hook-like claws; those on the anterior feet are four in number, the inner claw being the smallest; on the hind feet there are five claws. The claws of the fore feet, when the animal is walking, are naturally doubled inwards on a rough callous pad, and the outer portion of the fore feet only is applied to the ground. Each claw has a bony envelope at its base, like a tailor's thumb, growing from the bone of the toe. This acts as a protection to the tender base while digging. The claws of the hind feet are short, and the sole is a naked protuberant pad. The tail is very long, and is thick to the base; it is furnished with a profusion of long coarse flowing hair a foot in length, which hangs like a full deep fringe. On the head the hair is short and close, but on the rest of the animal it is long and shaggy, particularly on the top of the head and down the back, where it forms a kind of long mane. The general colour is grizzled brown, but an oblique black band bordered with white crosses the chest and passes over each shoulder to the flanks. The length of a full-grown specimen, exclusive of the tail, is about 4½ feet, and the tail is nearly 3 feet long, without taking the hairs into the account.

At a distance the ant-eater appears to be taller than it really is, from the erect hair of the mane, and the mode in which it carries its tail; it walks on the outer portion of the fore feet, and instead of being slow runs with a peculiar trot, keeping a horse on the canteer in the pursuit; nor does it readily tire. White ants or termites constitute its chief food, and these it obtains by pulling down their solid fabric by means of its large strong fore claws. In picking up the ants the movements of its tongue, which is alternately protruded and retracted, are so rapid that we cease to wonder how so large an animal can satiate its appetite with such small insects; it swallows much of the material of which the termites' tumulus is constructed, and will hold large lumps in one foot while it pulls them to pieces with the other, and picks up the insects thus dislodged. Other insects are also its prey, and in captivity it will eat fresh meat finely minced. The ant-eater makes no burrow, its ample tail being its sole protection against the weather. If the mother ant-eater be attacked she raises herself upon her hunches, and resting one fore foot on the

ground, strikes with the sharp claws of the other foot at her assailant; if the danger increase she throws herself upon her back, and strikes with both claws; should she succeed in throwing her arms round her adversary and fixing her claws in its flesh, she holds it with a rigid gripe. The jaguar is said to have perished in the combat; but D'Azara, an excellent observer, and author of the "Natural History of the Quadrupeds of Paraguay," thinks it very doubtful that the ant-eater, so slow and heavy in all its movements, has ever the chance of embracing the agile and powerful jaguar, which could kill it with a single blow of its paw.

The upper lip and nostrils of the ant-eater are remarkably flexible; and in the selection of its food it trusts chiefly to the sense of smell, which is exquisite; its sight, on the contrary, is dim. It frequents low savannahs and dense forests. The flesh of the ant-eater is regarded by many of the native tribes, and also by the negroes, as a delicacy.

The *Tamandua* (*Tamandua tetradactyla*). Though the terms *tamandua* and *tamandu* are names of the preceding species, called by the Brazilians *Tamandua Bandeira*, the word *tamandua* is appropriated by European naturalists to an arboreal species much inferior to the great ant-eater in size, and a native of the primeval forests of tropical America. In this species the muzzle is more abbreviated, and the snout more conical and less tubular than in the former animal; the fur is in general comparatively short, wiry, and glossy; and the tail, which is destitute of a flowing brush, is long, taper, thinly clad, prehensile, and naked at the tip. The eyes and mouth are small, the tongue capable of great extension; the nostrils are lateral slits; the ears small and rounded. The limbs and feet present the same conformation as those of the great ant-eater. The *tamandua* measures about 2 feet in length, exclusive of the tail, which is 1 foot 4 or 5 inches. This ant-eater is mostly found in trees, and aids itself in climbing by its prehensile tail; it feeds on ants, termites, and, as D'Azara states, on bees which form their hives among the loftiest branches of the forest, and have no sting. During repose it hides its muzzle in the fur of its chest, falls on its belly, and wraps itself round with the tail. The female has two pectoral teats, and produces a single offspring at a birth, which clings to her back and is carried for several months. The young are ill-formed and ugly.

The *tamandua* has a disagreeable musky odour, especially when irritated. Several varieties of *tamandua*, perhaps distinct species, are described; some are black, others straw-coloured; some silvery white, with a band over the shoulders.

The *little ant-eater* (*Cyclothorus didactylus*) forms the type of a distinct genus. It is characterized by the shortness of the muzzle, which is conical; by the number of the claws, which are two on each fore foot, of hook-like shape, compressed laterally, and very sharp, the outer one being considerably the longest; and by the hind feet having an oblique direction, and being armed with four short compressed claws. The tail is long, powerfully prehensile, and naked for 3 inches on the under surface at the tip. The claws of the fore feet resemble, in a great measure, those of the sloth, and are folded down on a callous pad; these, aided by the inward tournure of the hind limbs, and the prehensile structure of the tail, fit the animal for its arboreal residence. It possesses clavicles, which do not exist in the great ant-eater or in the *tamandua*. The eyes are small, the ears close and buried in the fur, the mouth small, the tongue vermiform. The fur is exquisitely fine, soft, curled, and silky. The general colour is golden brown, with a brownish mark on the back, often wanting. Length of head and body, 10 inches; of tail, 10½ inches. This beautiful little animal is a native of Central America, Guiana, and Brazil, where it lives in the forests, suspending

itself by its long tail, and clinging to the branches by means of its claws. It searches for insects amongst the fissures of the bark, and feeds on the nymphæ or grubs of wasps, attacking the nests, pulling out the insects with its fore claws or nippers, and sitting up to devour them in the attitude of a squirrel. In defending themselves these animals strike with both their fore paws at once, and with considerable force; they are nocturnal, and sleep with the tail twined around their perch. They utter no cry. The female makes a bed in the hollows of trees, and produces a single young one at a birth.

ANTECEDENT, a term used in grammar, logic, and mathematics. In grammar the noun preceding the relative is termed the antecedent, as in the sentence, "The surgeon who performed the operation was possessed of great ability." The word surgeon is the antecedent to the relative "who." In logic the term is given to the proposition from which another is deduced, or to a general proposition which serves as the basis of an argument. In mathematics it implies the first of the two terms of a ratio; the "consequent" is the second term. Thus, in the continued proportion—

$$2 : 4 :: 3 : 6 :: 4 : 8 :: 5 : 10,$$

2, 3, 4, 5 are antecedents, and 4, 6, 8, 10 are consequents. The plural of the term is also used to designate a person's past life, conduct, and character, as when it is said of anyone, "Nothing is known of his antecedents."

ANTELOPE, a group of the UNGULATA or hoofed mammals. The Ungulates are divided into two groups—(1) those in which the hoofs are odd in number, as the rhinoceros with three and the horse with one; and (2) those which have an even number of hoofs. The even-hoofed Ungulates are divided again into two groups—the OMNIVORA (hippopotamus and swine) and the RUMINANTIA. The most remarkable characteristic of ruminants is that they "chew the cud." The dentition is also peculiar; in the upper jaw there are no front teeth, but the gum is hardened into a pad, against which the eight lower front teeth bite. There are six back teeth in each side of each jaw, but these are separated by a wide gap from the front teeth. Ruminants may be divided into the following groups—Camelidæ (camels and llamas), Moschidæ (musk-deer), Cervidæ (deer), Camelopardalidæ (giraffe), and Caviornia. The Caviornia (hollow-horned) possess true horns, which differ from the antlers of deer in not being shed, and in being formed of a bony process of the forehead bone, covered with a horny sheath. There are three families—the Ovidæ (sheep and goats), the Bovidæ (oxen), and the Antelopidæ (antelopes).

Some of the antelopes, as the prongbuck of North America, the sambar-deer of the hill forests of Sumatra, and the chamois of the Alps, are in general form and habits closely allied to the goat family; while others, on the contrary, of large size and massive contour, as the eland and hartebeest of the Cape, and its ally the bubaline of Northern Africa, approximate in many points to the ox family. Again the gnus of South Africa in some respects approach the buffalo; the neck, mane, and tail resemble those of the horse, and the general action is more like that of the horse than that either of the ox, the goat, or the elegant gazelle. The nyi-ghau of India presents us with a very singular form; and the bush antelopes, formed for diving through the dense brush and jungle, have their peculiar characters. Again, some antelopes have a broad naked muzzle like the ox, which fits them for grazing on the pasturage of plains and meadows. Others have the muzzle attenuated and hairy like the goat, and browse upon plants or nibble the herbage; sometimes we find an intermediate form between these two extremes. In many species the females have only two teats, in others they

have four. In some the females are destitute of horns; in others they differ much both in contour and colour from the males.

Like the stag and the fallow deer, antelopes possess lachrymal sinuses, often called tear-pits, consisting of a sac or fold of the skin beneath the eye, furnished at the bottom with a gland which secretes an oily viscid substance closely resembling ear-wax. These pits, of greater or less extent, are capable of being opened or closed, but their precise use is not known; they do not communicate with the internal nostrils, and consequently have nothing to do with respiration. In most species inguinal pores are present; these are deep cutaneous sacs situated in the groin, secreting a glutinous waxy substance. In one species, the chamois, there is a pit behind each ear; it is nearly half an inch in depth, and opens externally by a small aperture.

The antelopes are generally covered with smooth short hair—some have a mane along the ridge of the neck; in certain species there are tufts of hair, called scopæ or knee-brushes, below the knee-joint of the anterior limbs. The ears are usually long and pointed, and the tail is short, often tufted. Generally speaking, these animals are gregarious, wandering in herds in search of pasturage, and are thus partially migratory. Some live in pairs, or small families only. They are timid, watchful, and cautious, and enjoy the senses of hearing, sight, and smell in great perfection. Africa may be considered as the headquarters of the antelopes; only two inhabit Europe, and two North America. The precise nature of the locality tenanted by the various species is very different. Wide plains, the steppes of Central Asia, the karroos of Africa, mountain ranges, deep woods, and dense jungles, have all their appropriate species.

The common antelope, black buck, or sasin (*Antelope cervicapra*) is noted for the spiral twist of its ringed horns. It is found in every part of India, and is remarkable for its extreme fleetness and its wonderful agility, leaping as much as 12 feet in height, and clearing a space of 10 or 12 yards at a single bound. These antelopes reside in the open plains, living in families consisting each of fifty or sixty females and a single male, exclusive of a number of young bucks, which are stationed around the herd as sentinels. On the least alarm the whole troop is in rapid motion, and the swiftest dogs are left far behind. The cheetah is trained to pounce upon these antelopes by surprise; the hawk is also used, but not flown at the males, on whose horns it would be soon transixed. It harasses and impedes the animal, giving time for the dogs or the hunter to come up. The long sharp horns of the sasin are used as weapons by the fakirs and dervishes of the East.

The harnessed antelopes (*Tragelaphus*) are so named from many of the species having white stripes running down the body, with connecting bands, suggesting the idea of harness. These antelopes are natives of South Africa, and are near allies of the eland and koodoo.

When describing the fauna of the Renbo region, M. Du Chaillu says:—"I saw here several specimens of a very beautiful antelope hitherto unknown, which may be considered by far the handsomest antelope yet discovered in Africa." It is characterized as being in general colour bright orange, with a chestnut patch between the horns and eyes, below which is a white crescent, having in the middle a dark brown stripe; on each side occur a number of white stripes. This is the Bongo antelope (*Tragelaphus albo-cirgatus*).

Captain Speke named two beautiful new species. One of these, the Ugogo antelope, is about the same size and shape as the Indian antelope, but differs in the shape of the horns and colour. The other, a waterbuck, was found

in Karagûé. This species is called *Tragelaphus Spekii*, in honour of the discoverer. It is closely allied to a water-boc found by Livingstone on the Ngami Lake. There are fifty-five species, according to Giebel, if the caprine antelopes (chamois) are included among the goats; five-sixths



Ugogo Antelope (*Tragelaphus Spekii*).

of these are African, four-sixths coming from parts lying to the south of the Sahara. There are only three species from Asia, north of the Himalayan Mountains; the rest are natives of the Indo-Malayan region.

The following are the names of other remarkable antelopes, which will be noticed under their respective headings:—Addax, Blauwbok, Bless-bok, Bubaline, Cambing-outan, Chamois, Chikara, Chiru, Eland, Gazelle, Gnu, Goral, Hartbeest, Koodoo, Lechée, Madoqua, Nyghau, Oryx, Pallah, Prongbuck, Reh-bok, Reit-bok, Saiga, Spring-bok, and Stein-bok.

ANTENNÆ are horn-like members placed on the heads of Insects, Myriapoda, Arachnida, and Crustacea, two in number in Insects, but more in crabs and lobsters. They are always connected with the head near the eyes, by means of a ball and socket, and are composed of minute cylinders or rings successively added to each other, to the number of thirty in some butterflies; thus forming a tube which incloses nerves for sensation, muscles for moving, as well as air pipes and cells.

The form of the antennæ is exceedingly various, some being simple, some feathered, some clubbed, and others comb-shaped, and so on *ad infinitum*. They vary also greatly in length, and in one kind of beetle are four times the length of the body.

In the higher Crustacea, as the lobster, there are distinct organs of hearing placed at the base of the larger antennæ. That insects hear may be readily believed; they utter or produce sounds by way of calls to each other, as we may notice in the cricket, grasshopper, treehopper,

death-watch, and others; and judging from analogy it is at least probable that the auditory nerves are those of the antennæ. From the experiments of Sir J. Lubbock it may, however, be inferred that ants neither utter any sound nor are in any way affected by sounds. In some insects the antennæ appear to be used as feelers. If we watch one of the ichneumon flies traversing any surface, we shall observe its antennæ in rapid motion, touching again and again the ground before it. Ants employ their antennæ as organs of communication, and by their means receive or convey information. Their antennæ enable these insects, as it is asserted, to avail themselves of numerous signals, which are understood among themselves, and this Huber termed *antennal language*; but whether the signals of direction, information, or greeting are invariably made by the antennæ or not, and what those signal-motions really are, we cannot positively demonstrate. We cannot doubt that the antennæ are the organs of some important sense; and from the relative size of the nerves supplied to them, of a sense extremely acute.

ANTENNA'RIOUS is a genus of fishes nearly allied to our British fish the ANGLER. It is an inhabitant of mid-ocean in the tropics. A very bad swimmer, it attaches itself to floating sea-weed, and is thus carried by wind and currents far and wide, and is often found on the coasts of temperate climes. It has the power of assimilating its colour to any object to which it clings, and with the movable spines on the top of its head probably attracts and preys upon fish, like the angler.

ANTEQUE'RA, a town in the province of Malaga, Spain. The plain in which it stands is one of the richest in the province, from its being irrigated by the rivers Guadaljore and Lavilla, and produces all kinds of grain, fruit, wine, and oil. The neighbouring mountains abound in fine wood, white, black, and red marble, limestone, and gypsum. About 8 miles north-west of the town is a lake of salt water, 4 miles in length and a mile in breadth, which in the summer months, from the watery particles being evaporated, becomes a solid mass of rock. The manufactures of Antequera consist of common woollen stuffs, silk, leather, paper, and soap. There are several churches and convents, a college, and an old castle. Antequera, which occupies a commanding position, is situated on the railway, by which Malaga and Granada are placed in direct communication with the rest of Spain. It has extensive remains, and is supposed to be the Roman *Antiquaria*. After its capture from the Moors, in 1410, it became one of the chief posts of the Christian power in the peninsula. Population, 30,000.

ANTHELMIN'TICS are medicines used for the destruction or expulsion of worms from the human intestines. At least six varieties of these parasites are known to infest the human body, but their origin or the mode of their introduction to the system are subjects which are not yet fully investigated. The most common is the large round worm (*Ascaris lumbricoides*) which is found in the smaller intestines. It is very like an earth-worm in appearance, but of a lighter colour, and is more pointed at the ends. It varies in length from 1 to 5 or 6 inches, and is sometimes found in large numbers, though in general but one or two are present. The best remedy for getting rid of them is antoine, the active principle of wormseed. The dose is from 2 to 5 grains, in a little castor oil, or combined with an equal quantity of jalap powder, taken in the morning, an hour or two before breakfast. This should be repeated for two or three mornings, and attention should also be paid to the improvement of the general health. Another parasite infesting the small intestines is the tape-worm, of which there are three varieties—the *Tenia solium* or common tape-worm, the *Tenia medocanallata* or hookless tape-worm, and the *Bothriocephalus latus* or broad tape-worm,

which is very common in Russia, Poland, and Switzerland, but is seldom found in Great Britain. The origin of the tapeworm has been more clearly traced than that of some of the other parasites, and it is found to occur most frequently where much pork is consumed, and is generally introduced into the system by means of raw or underdone meat. Its general appearance is pretty well known. It varies in length from a yard to 20 feet, and it sometimes causes considerable functional derangement. Various medicines are used to procure its expulsion, among which may be mentioned the male shield fern (*Aspidium felix mas*), of which the dose is 1 drachm of the liquid extract of the root; kousso, prepared from the flowers and tops of the *Brayera anthelmintica*, an Abyssinian plant, of which the dose is half an ounce, taken in a little water; and an infusion of the bark of the pomegranate root, made by soaking 2 oz. of the bruised bark for twenty-four hours in a quart of water, which is afterwards boiled down to one-half, and is taken in three doses, separated by intervals of about half an hour. All these medicines are taken fasting; the patient should go to bed without supper, and take the medicine the first thing in the morning. They act freely on the stomach and bowels, and the intruder is usually expelled at once. The worm diminishes in breadth towards the head, and the neck is long and thread-like in appearance. This should always be looked for, as it remains in the body it will go on forming fresh joints. If the head comes away no further trouble need be anticipated, but if it does not smaller doses of the extract of the male fern root of about ten drops should be taken three or four times a day for several days. The parasite should be burned when expelled, or strong carbohc acid should be poured over it.

Another form of worm which infests the larger bowel or rectum is the thread or seat worm, of which there are two varieties—the long thread worm (*Trichocephalus dispar*) and the *Ascaris vermicularis* or maw-worm, which resides in the lower part of the bowel. They are of common occurrence in children, and are sometimes found in large numbers, when they cause considerable itching and irritation. The best mode of treatment is the injection of an infusion of quassia, of salt and water, or of tincture of steel, a tablespoonful of which should be mixed with a pint of cold water. This should be repeated daily until the worms are destroyed.

In all cases the greatest care should be taken to destroy completely the parasites expelled from the body, and personal cleanliness should be carefully attended to. The ovum of the tape-worm is destroyed when the meat in which it is deposited is fully cooked, but districts in which the people indulge in underdone or raw meat are generally found to be infested with it. In Abyssinia, where beef is generally eaten raw, the tape-worm is exceedingly common, and scarcely any of the inhabitants escape its attack.

AN'THEM, a musical composition for the church service, somewhat in the form of a motet. It is almost peculiar to the Church of England, and forms an integral part of the cathedral service.

The words of an anthem are selected from Scripture, and the music varies in treatment to almost any extent, according to the sense of the words. Anthems containing parts for solo voices are called verse anthems, and such parts are called verses; anthems for chorus only are called full anthems. Some anthems are unaccompanied, but most have an organ part. Specimens of Elizabethan anthems exist in considerable numbers; especially those of Gibbons and Tallis are remarkably fine works. A cluster of excellent anthem writers flourished at the Restoration, the music taking its tone rather from Lully and the French than from the Elizabethan school, as befitted the French taste of his sacred majesty, who "being a brisk and airy prince was soon tired with the grave and solemn way which

had been established by Tallis, Byrd, and others." Pelham Humphreys, Wise, and Blow made king Charles, as Pepys remarked, "keep good time with his hand all along the anthem." The great Purcell followed, and with him Croft, Weldon, and Clarke. The following century (eighteenth) gave us Greene, Boyce, and Battishill, and the twelve Chandos Anthems of Handel; and the present day is rich with composers in this ever-varying and delightful "form," whose elasticity is such that Tallis and Gounod find themselves alike free within its bounds.

It is possible that the word anthem is derived from *antiphon*, and was originally an antiphonal or responsive composition; but such a character has never been absolutely known to belong to it.

The English school has always excelled in the composition of anthems. Tallis led the way in full anthems, and was immediately followed by Byrd and Farrant; since whose time down to and including our own day (excepting perhaps the commencement of the present century) England has never been without musicians celebrated in this class of composition.

AN'THEMIS is the genus of plants to which the useful herb camomile belongs. It is one of the *COMPOSITÆ*, and is distinguished by having the scales that surround its flower-heads overlapping, and membranous at the border; by the outer florets being of one row, strap-shaped, and having pistils only; while those of the centre are tubular, with both stamens and pistils; by the pappus being a membranous margin or altogether wanting; and by the receptacle on which the flowers stand being convex, and covered with little chafy scales.

Anthemis nobilis, or camomile, is frequent in a wild state on many of the commons near London, where it adds a peculiar richness of colour and fragrance to the turf. It is a very dwarf plant, with finely-cut downy leaves; its flower-heads are white in the ray, but deep yellow in the disk; all the parts are intensely bitter, but especially the little yellow flowers of the disk; for this reason the wild blossoms are far more efficacious than those of the cultivated sort, in which there is scarcely any disk, the flowers of the ray having almost entirely usurped their place.

There is another wild plant, called *Anthemis cotula* or mayweed, which must not be confounded with camomile, to which it bears great resemblance. It may be distinguished by its being an erect branching plant, with quite smooth leaves and an exceedingly disagreeable and powerful odour.

Anthemis tinctoria is used in France by dyers for the sake of a brilliant yellow tint which is obtained from it.

Camomile is an excellent bitter and tonic agent. Given in powder, or pill, or extract, with addition of a few drops of the oil, it is of great service in dyspepsia, atonic gout, and in intermittent fevers. The infusion may be made the vehicle for alkalies or acids. When tepid it is emetic, and may be given beneficially in dyspepsia, and at the commencement of catarrh (particularly influenza) and hooping-cough. The decoction is an objectionable form, as it dissipates the oil. Even the infusion should be made with cold water. The infusion of camomile, either warm or cold, furnishes an excellent application to weak eyes, or after exposure to the wind in travelling. This used early will often ward off inflammation.

AN'THER, in botany, is the name given to the head of the stamen. The **STAMENS** are the parts of the flower which come next inside the corolla, and usually consist of fine stalks (*filaments*) with heads (*anthers*). The anther is generally composed of two lobes, which contain a yellow dust (*pollen*), the fertilizing agent. When the pollen is ripe the lobes open, generally by a vertical slit, but in others, e.g. the heath family, by pores at the top. Sometimes the slit is placed inwards towards the pistil (*in-*

trorse), sometimes at the sides or outwards (*extrorse*). In most cases self-fertilization is impossible, as either the anther ripens and decays before the pistil matures (*proterandrous* plants), or the pistil matures before the anther (*proterogynous*). In the daisy and other composites the anthers are joined together in a cylinder round the pistil (*syngenesious*). The lobes are united by a part called the *connective*, which in most flowers is small. In *salvia* the connection is long, hinged at the middle to the filament, with the lobes at each end, so that one stands at some distance vertically below the other, and this has little or no pollen. When a bee thrusts its head into the flower it pushes the lower lobe upwards, and thus the upper one is brought down and brushed against the bee's back; the pollen is shed, and carried off to be rubbed on the stigma of another *salvia*. See CROSS-FERTILIZATION.

ANTHERIDIUM, in botany, designates certain cells or masses of cells in flowerless plants, that give rise to the male reproductive bodies called *spermatozoids*.

ANTHOL'OGY, a compound Greek word, used metaphorically, which signifies "a garland of flowers." It consists of short poems on amatory, convivial, moral, funeral, monumental, descriptive, dedicatory, satirical, and humorous subjects. Their characteristic merit consists in the just expression of a single thought with brevity and poetic beauty. The term *anthology* is peculiarly appropriated to a collection of Greek epigrams; but the word epigram is not here used in the confined sense of a pointed and witty conceit, but in the more enlarged and liberal acceptance of an *inscription*. The earliest and closest application of the term epigram was to certain short sentences inscribed on offerings in the temples, on buildings, and statues. The largest portion of those collected in the Greek Anthology were written in honour of the dead, or as tributes to beauty in gratitude for acceptance, or in complaint on account of rejection; some of them are pungeries on living and illustrious virtues; others contain brief records of remarkable events; others again consist of observations on human life, for the most part in a dark style of coloring.

Meleager the Syrian lived probably somewhat less than a century before the Christian era, and is generally understood to have been the first who collected the scattered fragments of the Greek inscriptive verse. The first printed edition of the Greek Anthology was that of Lascaris, which appeared at Florence in 1494. Most nations have their own Anthology.

ANTHOSAN'THUM is a genus of GRASSES belonging to the tribe *Phalaridæ*. The flowers are arranged

pressed at the sides, and has two glumes—the lower one small and one-veined, the upper large and three-veined. There are only two stamens in the flower. The sweet-scented vernal grass (*Anthoxanthum odoratum*) is the only species found in Britain; but there are two forms of this—one growing in woods with *yellow* anthers and the other in pastures with the anthers *purple*. It may be at once known among other native British grasses by having only two stamens *constantly* in *all* the flowers. It grows about a foot high, and though it has less saccharine matter than most fodder grasses it is considered a valuable ingredient on account of its containing a resin (*coumarin*). The sweet scent of new-mown hay is due to the coumarin, and this fragrant principle occurs also in woodruff, nuelilot, and the Tonquin bean. Some are of opinion that hay-fever is caused by the action of coumarin on the brain.

ANTHRACENE ($C_{14}H_{10}$), synonymous with paranaphthalin, a solid hydrocarbon occurring in coal tar. It was first obtained by Dumas and Laurent in 1832. In 1868 Graebe and Liebermann discovered that alizarin is converted into anthracene when heated with finely divided zinc. The discovery of the converse reaction, or the conversion of anthracene into alizarin, soon followed, and thus an entirely new industry was created, namely, the manufacture of dye stuffs up to that time only obtainable from the madder tribe.

One hundred tons of coal tar yield about 0.63 of a ton of anthracene; or 1 ton of anthracene can be obtained from the distillation of 2000 tons of coal.

The rough product, termed anthracene oil, sent into the market by the coal-tar distiller, is allowed to stand in tanks until the solid hydrocarbons have separated, and the deposited matter filtered through sackcloth bags, the mother liquor being finally squeezed out by hydraulic pressure, or by a centrifugal machine, followed by hydraulic pressure. The mother liquors are again distilled, and the solid products treated after the same fashion. The crude anthracene is purified by hot and cold pressing and washing with distillates of petroleum. For the final purification Schuler recommends distillation, or rather sublimation, a current of air being driven into the retort. Tolerably pure anthracene is driven over, and condenses in yellowish snow-like flakes. This is boiled with freshly distilled petroleum boiling at 120° to 150° C., and filtered and well pressed. Chemical purity is attained by crystallizing two or three times from alcohol, subliming the product, and washing with ether.

When pure, anthracene crystallizes in shining white scales or rhomboidal tables. When obtained by sublimation, it forms a very light mass of pearly white flakes. It melts at 213° C., and distils at about 360° C. It sublimes easily, yielding a fœtid and irritating vapour. Carbon disulphide dissolves 1.7 per cent. of anthracene, cold benzene 0.9 per cent., and alcohol 0.6 per cent. In water and aqueous alcohol it is insoluble. Nascent hydrogen unites with it, forming anthracene hydride ($C_{14}H_{12}$). With chlorine, dichloranthracene ($C_{14}H_8Cl_2$) and dichloranthracene tetrachloride ($C_{14}H_4Cl_4$) are produced. Bromine forms similar compounds. Oxidizing agents convert it into anthraquinone and its derivatives. Concentrated sulphuric acid dissolves anthracene with the production of anthracene mono- and di-sulphonic acids. See ALIZARIN.

ANTHRACITE, a black, light, mineral substance, a variety of coal. It is also called *blind coal* and *glance coal*. Its specific gravity is about 1.400. It is slowly combustible, but without flame; and it contains 93 per cent. of pure carbon; it is, in fact, a mineral charcoal. Naptha may be considered as one extremity of the mineral carbonaceous substances, and anthracite as the other. Tar, petroleum, bitumen, asphaltum, and the various kinds of coal, form the intermediate members of the series.



Anthoxanthum odoratum. a. magnified.

in spikes round the stalk. Each spikelet consists of a perfect flower and two imperfect; it is com-

Bischof has calculated that it would take 12 feet in depth of compact vegetable debris to make 1 foot of anthracite coal; so that, allowing for impurities, a bed 30 feet in thickness, such as occurs in Wilkesbarre, must have been formed by a mass of vegetable matter at least 360 feet thick. Anthracite is used for fuel where a smokeless fire is necessary, as in hop-drying, but it is much more difficult to light than ordinary coal. In America it is also made use of for smelting iron. Where coal-beds have been much upheaved and contorted the coal loses its bitumen and becomes anthracite. An instructive instance of this occurs in Pennsylvania, where bituminous coal is found in the horizontal beds to the westward. Travelling south-eastward, the beds become bent and dislocated, with loss of part of the bitumen; until in the Appalachian Mountains, near Pottsville, they are found quite turned over, and the coal has become a true anthracite. This variety of coal is also found in South Wales, Llanthylltyr, and Kilkenny.

ANTHROPOLOGY (*ἄνθρωπος*, man, and *λόγος*, an account) is, in its widest sense, the natural history of man. It takes a general and connected view of the inferences arrived at in other sciences concerning his bodily and mental nature. On the one side it considers the anatomy and physiology, thus fixing his place in nature, and, moreover, investigates the varieties or races of mankind. On the other side—the mental aspect—it inquires into the works of man, which inquiry, if it deal with prehistoric times, forms part of *ARCHÆOLOGY*; and investigates the growth of language, religion, ethics, and law. Another branch of anthropology is *ETHNOLOGY*, which takes more particular account of the customs and institutions of uncivilized tribes.

I. *Species*.—Quatrefages limits the object of anthropology to "the study of man as a species," and we will follow him in our inquiry whether there is only one species, or whether the various groups of man, such as European and Negro, represent so many distinct species. Those who accept the latter doctrine ("Polygenists") argue from the great difference apparent in colour of skin, character of hair, size of body, dimensions of the skull and other parts of the body. On the other hand, those who believe that the various groups are *races* belonging to the same species ("Monogenists") point out that in every one of these particulars there are very much greater differences between races of animals belonging to the same species—for instance, in the various breeds of dogs; that the characters of a group (e.g. height and colour) blend into those of another by invisible shades, independently, in many cases, of their having intercrossed; and, moreover, that these reappear in other widely separated groups. An important argument is urged by Quatrefages from the consideration of the phenomena characteristic respectively of mongrels and hybrids. Crossing between individuals belonging to different *races*, and the consequent production of *mongrels*, is of constant occurrence in nature, and sometimes increases fertility; whereas crossing between *species* to produce *hybrids* hardly ever occurs naturally, is only effected artificially and with great difficulty in a few species, and in nearly every case lessens the power of reproduction. The mongrel offspring is fertile, and produces a race with intermediate characters, but always liable to reproduce those of either of the parental types. The hybrid offspring, on the other hand, is only in rare cases fertile, and then either gradually dies out, or, varying without any tendency to become a fixed race, at last reverts to one of the original types and loses the power of varying towards the other. These laws, if valid, leave no doubt as to the unity of the human species. Darwin confirms this. "The races of man," he says, "are not sufficiently distinct to co-exist without fusion, and this it is which in all ordinary cases

affords the usual test of specific distinctness." A difficulty arises from the fact that these races for a long period have to a very great degree remained fixed, and the question is put how these could have come by variation from a single stock. Mr. A. R. Wallace has suggested that in primitive times, when man could not provide so well against climate and want of food, he was more *plastic* than in historic times to the influence of external circumstances.

II. *Man's place in Nature*.—Linnæus placed man with apes, monkeys, lemurs, and bats in his first order Primates; and although many zoologists class him apart from apes, it is not on account of the *anatomical* but of the *mental* and *moral* differences. Huxley, while including man among Primates, acknowledges "an immeasurable and practically infinite divergence, ending in the present enormous gulf between the family of apes and the family of man." See *MAN*.

III. *Origin of the Human Species*.—There are two theories held with regard to man's origin—the one of special creation, the other of evolution from some lower type. Hæckel with much confidence traces the development of man from a creature which he calls an "ape-man," thence from the old-world apes, and so on, till at last he reaches a simple speck of protoplasmic matter, the *monera*. Darwin is of opinion that we are "able partially to restore, during successive periods, but not in due order of time, the structure of our early progenitors. This can be effected by means of the rudiments which man still retains, by the characters which occasionally make their appearance in him through reversion, and . . . the aid of the principles of morphology and embryology. The early progenitors of man were no doubt once covered with hair, both sexes having beards; their ears were pointed and capable of movement; and their bodies were provided with a tail having the proper muscles. Their limbs and bodies were also acted on by many muscles which now only occasionally reappear, but are normally present in the *Quadrupana*. . . . The foot, judging from the condition of the great-toe in the fetus, was then prehensile; and our progenitors, no doubt, were arboreal in their habits, frequenting some warm, forest-clad land. The males were provided with great canine teeth, which served them as formidable weapons. At a much earlier period the eye was protected by a third eyelid or nictitating membrane. At a still earlier period the progenitors of man must have been aquatic in their habits, for morphology plainly tells us that our lungs consist of a modified swim-bladder, which once served as a float. The clefts on the neck in the embryo of man show where the branchiæ once existed. At about this period the true kidneys were replaced by the *corpora woffiana*. The heart existed as a simple pulsating vessel, and the chorda dorsalis took the place of a vertebral column. These early predecessors of man, thus seen in the dim recesses of time, must have been as lowly organized as the lancelet or amphioxus, or even still more lowly organized." St. George Mivart grants the possibility of the evolution of the body, but demands belief for the supernatural creation of the soul. Wallace, who formulated the theory of the origin of species about the same time as Darwin, holds diverse views with regard to man. According to him immediate and personal utility is the only cause which sets selection in action. It was utility alone which caused the development from apes of a superior being, inhabiting a warm region, and of sociable habits, but still incapable of thought or moral feeling. Towards the early part of the tertiary period an unknown cause began to develop this ape-like animal's intelligence, which became more useful than any other organic modification. Selection acted in this direction. The superiority acquired by the intelligence has removed man from the law of action of morphological transmutations, and so while

intellect has so vastly increased the body has not varied much. Selection admittedly cannot produce variation which is injurious, but neither can it produce one that is useless. It cannot then produce an organ in such proportions as would go beyond its degree of present utility. Now in savages there are organs whose development is out of all proportion with their *present utility*, and even faculties and physical characters which are useless or injurious, at least to the individual. "But if it can be proved that these modifications, though dangerous or useless at the time of their first appearance, have become much more useful, and are now indispensable to the complete development of the intellectual and moral nature of man, we ought to believe in the existence of an intelligent action, foreseeing and providing for the future, just as we should do when we see a breeder set to work to produce a definite improvement in any direction in any cultivated plant or domestic animal." Though the brain of savages is to that of civilized nations as 5 : 6, the intellectual manifestations are as 1 : 1000. A brain a little more highly developed than a gorilla's would apparently be sufficient for

however, do exist more or less permanent and strongly marked, which when taken together are of great value. In considering the races of man we are indebted to Tylor's "Anthropology." It has been found that the physical or anatomical characters are the most useful; the moral and intellectual come next; and finally, if proper care be taken, hints may be gleaned from language, religion, and social customs. The evidence supplied by the colour of the skin has always been considered one of the chief marks of race. The Egyptians, three or four thousand years ago, depicted the four races known to them in their hieroglyphic writings. In a rather conventional manner they coloured representations of themselves red-brown, the inhabitants of Canaan yellow-brown, the Libyans of North Africa yellow-white, and the Ethiopians coal-black. Caste (Sansk. *varna*, colour) arose in India from a distinction of "colour" between the light-coloured Aryan conquerors and the dark natives. Amongst Europeans two varieties may be traced—the northern fair-white (Saxon) type and the southern dark-white (Keltic) type. Other colours are the yellowish-brown of the Chinese, the full-brown of

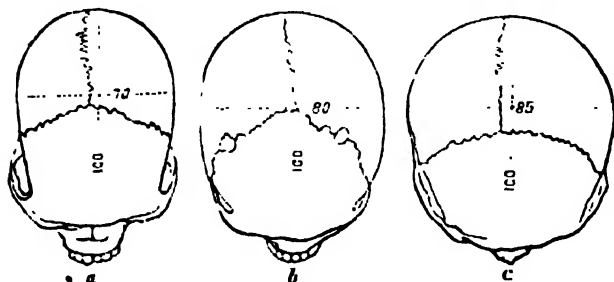


FIG. 1.—Top view of skulls: *a*, Negro, index 70, dolichocephalic; *b*, European, index 80, mesocephalic; *c*, Samoeyd, index 85, brachycephalic. (After Tylor.)

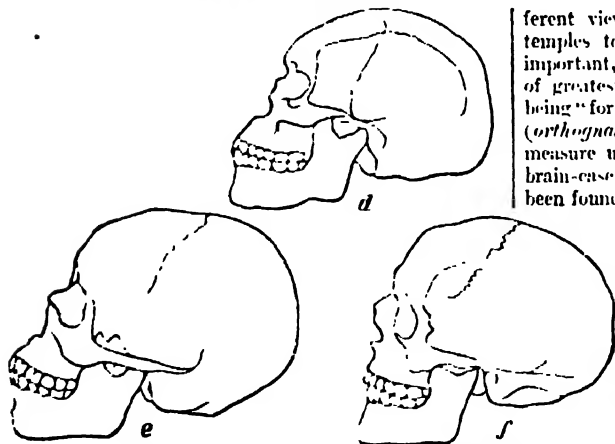


FIG. 2.—Side view of skulls: *d*, Australian, prognathous; *e*, African, prognathous; *f*, European, orthognathous. (After Tylor.)

the Andaman islanders. The latent aptitudes in the brain, larynx, and larynx of savages, which are temporarily useless, cannot be attributed to natural selection. *Divine selection* is alone capable of producing "the wonder and glory of the universe"—man.

IV. *Essence of Manhood*.—Every one admits the existence of distinct races. The Negro, Australian, Chinese, and European may easily be distinguished from one another; but it is difficult to state precisely the characteristics, and impossible to mark the limits, of each group. Characters,

different views in each skull of the *zygoma* joining the temples to the cheek-bone. The shape of the skull is important, and the distance from the centre of the line of greatest breadth. Fig. 2 shows how races differ in being "forward-jawed" (*prognathous*) or "upright-jawed" (*orthognathous*). Since power of intellect depends in some measure upon the size of the brain, the capacity of the brain-case is measured by filling it with sand; and it has been found that in the Australian this is on the average 79 cubic inches, 85 in the African, and 91 in the European. The structure and arrangement of the hair is of some importance; the Papuan has frizzy hair, the Negro woolly, the European wavy or curly, while the American, the Mongolian, and the Malayan have straight hair. The average height varies from 5 feet 11 inches in the Patagonians to 4 feet 6 inches in the Bushmen of South Africa, but even this difference is a small proportion of the height, especially as compared with the differences in various breeds of animals. The features, depending to some degree upon the form of the skull, are very often good marks of race. The negro, for instance, has a narrow skull, convex forehead, projecting jaws, snub nose, and fleshy lips. The relation between constitution and climate is a well-known fact. English children do not thrive in India, and Hindus are unable to endure our variable climate.

The latest classification of races is that by Professor Huxley. According to him there are four principal types—the Australioid, Negroid, Mongoloid, and Xanthochroic (fair skin), and to these he adds a fifth variety, the Melano-chroic (dark-skin). The Australioids have a chocolate-

brown skin, their eyes are dark-brown or black, the hair black and wavy, the skull dolichocephalic, the brow-ridges strongly marked, the jaw projecting, the lips coarse, and

low castes of the south. It is possible that some of the Umbrian tribes are closely related, and this would seem to imply that the ancient Egyptians were of the same stock,



Circassian.



American Indian.

though probably mixed with Asiatics. In the Negroids the skin and eyes are dark-brown or brown-black, the hair black and woolly, the skull dolichocephalic, the brow-ridges not prominent, the jaw projecting, the lips coarse



Malay.



Negro.

the nose broad. The Australian savages form the type, and probably to the same race belong the people who inhabited India before the invasion by the Aryans from the north, and are now represented by the hill tribes and

and projecting, and the nose flat and broad. This race is best represented by the African negroes inhabiting regions lying near the equator. The Bushmen of South Africa are thought to be a modification of this type, and the Hottentot

a cross between the Negroid and Bushman. The skin of the Bushman is yellowish-brown, and his stature is diminutive. Another modification is formed by the Negritos, inhabiting the Andaman Islands, Malay Peninsula, Philippines, and other islands from New Guinea to Fiji (Melanesia), as well as Tasmania. The skin is dark, the hair woolly, and skull dolichocephalic. The Mongoloids inhabit the region lying east of a line drawn from Lapland to Siam. The skin is yellowish-brown, eyes black, hair black and straight, the skull brachycephalic, the brow-ridges not prominent, the nose small and flat, the eyes oblique, and the stature short and squat. The Chinese and Japanese only differ in the skull being dolichocephalic. Hungarians and Finns show their connection by their language rather than by physical structure. The Micronesians, Polynesians, and Maoris are probably mixtures of Malays and Melanesians. It is generally supposed that the American Indians belong to the Mongoloids of Eastern Asia. The Xanthochroi or "fair whites" inhabit Northern Europe, and may be traced as far south as North Africa and as far east as India. The skin is almost colourless, eyes blue or grey, hair varies from straw-yellow to chestnut, skull mesocephalic, and stature tall. They mingle with the Melanochroi in the south and west, and with the Mongoloids on the north and east. The Melanochroi or dark whites are represented by Kelts, and populations of South Europe, as Spaniards, Greeks, and Arabs. The Melanochroi may perhaps be accounted for as the result of crossing between the Xanthochroi and the Australoids.

ANTHROPOMORPHISM (a compound Greek word, made up from *anthropos*, man, and *morphe*, form) literally signifies the representation of the human form, but it is used to signify the representation of the Deity under a human form. The Egyptians represented deities under human forms as well as those of animals, and sometimes used a combination of the two. The Persians, as Herodotus tells us (i.e., 131) adored the Supreme Being under no visible form of their own making, but they worshipped on the tops of the mountains and sacrificed to the sun and moon, to earth, fire, water, and the winds. The popular idea of the ancient Greeks never separated the idea of superior powers from the representation of them under a human form; and in their mythology and art each deity had his distinguishing attributes and characteristic human shape.

Among the ancient Hebrews we find that anthropomorphic ideas prevailed most extensively at the early period of their history. The Scriptures are full of terms applied to God which properly relate to human beings, and we read of the eyes, the ear, the arm, the hand, and the feet of God. In several places also the Supreme Being is represented after the idea of an Oriental sovereign, as a monarch seated upon a throne surrounded by his attendants and messengers. It is not clear, however, how these terms or representations were understood by the writers, and the common use of similar expressions by Christian theologians and teachers at the present day should warn us against the supposition that they were taken by the Hebrews in any strictly literal sense. It is certain that during the latter period of their history they held the loftiest conceptions of the spirituality, wisdom, power, and beneficence of the Supreme Being, and these truths are set forth in some of the psalms and prophecies with the utmost clearness and force.

It is evident, however, that while it is very difficult to form a conception of things spiritual except by analogy from things natural, there must always be a danger attending the use of terms borrowed from our own nature, of forming narrow and limited ideas of the infinite God. The tendency to this is always existing, and needs ever to be guarded against in theological study or meditation. In

the early church the Audeans, a Syrian monastic sect which existed in the fourth century, held the belief that God was possessed of a human shape, and the Waldenses have been unjustly accused of the same error.

A somewhat similar notion has been held by certain philosophers, and Hobbes, Forster, and Priestley in their speculations invest God with a subtle but yet material body. Some of the German school, on the other hand, in their efforts to get rid of anthropomorphism, reject the idea of personality, speak in vague terms of the "subjective consciousness of God in the human soul," or regard the Divine Being as simply "the moral order of the universe."

ANTIARIS. See UPAS TREE.

ANTIBES, a town of France, formerly in the department of Var, but since 1860 in Alpes Maritimes, is a fortified seaport on the Mediterranean, surrounded by olive, orange, and vine plantations. The town is most beautifully situated on a promontory, and commands a charming Mediterranean view of the Bay of Nice and the Alpes Maritimes. The population amounts to 6000, and are chiefly engaged in the fisheries and the coasting trade; the principal articles of their commerce being salt fish, wine, olive oil, oranges, figs, and other dried fruits. The anchovies prepared here are held in great estimation. The harbour is small but deep, defended by a square fort built on a rock, and formed by a long semicircular jetty, which terminates in a lighthouse, and is bordered by a quay and a range of arcades. The most remarkable buildings are the parish church, two high towers, built, it is said, long before the Christian era, and the town-hall. It has a naval school and a tribunal of commerce. Antibes is the ancient *Antipolis*, and is said to have been founded as a Greek colony B.C. 340. It ranked as an Italian city under Augustus, and has numerous Roman remains. It was devastated by the Saracens in the ninth century, but its defences were afterwards restored by Francis I. and Henry IV. In 1746, during the Austrian War of Succession, it was unsuccessfully besieged by the English and Imperialist forces. Napoleon was refused admission here after his return from Elba.

ANTICHLOR is the name given by papermakers to the sulphite or the hyposulphite of soda, used to neutralize or remove the traces of chlorine left in the pulp by the bleaching process. The same substance is also used in the manufacture of linen for a similar purpose.

ANTICHRIST, a word meaning the enemy of the Messiah, occurs only in the epistles of St. John. It is, however, referred to there as being a familiar term: "As ye have heard that antichrist should come" (1 John ii. 18), and the idea that there would be a great opponent to the Messiah was prevalent among the Jews previous to the birth of Christ. The Jewish conception of Satan had been largely modified by their intercourse with the Persians, and from the accusing angel, as represented in some of the earlier parts of the Old Testament, he had become the enemy of God and the persecutor of man. He had a kingdom and servants, and was the prince of the world, of devils, and of the power of the air. It was believed that he would oppose the Messiah to the utmost, but would be unsuccessful, and would be defeated and overthrown by God's anointed deliverer.

This idea was still generally received among the Jews at the time of Christ, and it was adopted in a modified form by those who formed the early church. The references in the New Testament to this power opposed to the Christ are found in 2 Thessa. ii., in the epistles of St. John, and in the Apocalypse. The meaning of the "man of sin" spoken of by St. Paul has been variously understood by commentators, and there is nothing like a general agreement as to the power, person, or influence referred to by him. In the epistles of St. John the

meaning of the term is spiritualized, and the writer explains that the antichrist, indeed many antichrists, have already come, and that they are to be found in those who deny that Jesus is the Christ. In the Apocalypse the opponent is spoken of as "the beast," and it is now generally thought that under this image the Roman empire, the head of heathendom and ungodly power, was typified. There was a belief very widely current at the period this book was written that the Emperor Nero was not dead, but that he had retired for a time beyond the Euphrates, whence he would return as the antichrist; and by some critics this idea is found in the vision of the head of the beast which received a deadly wound, but which wound was healed. There was a revival of this delusion concerning Nero as late as the fifth century. Many attempts have been made to solve the riddle proposed in the number of the beast. Perhaps the most probable is that which finds the answer in the Greek words *Neron Kaisar*, which, when rendered into Hebrew (where, as in the Greek, every letter of the alphabet represents also a numeral), will work out the required number 666.

As time passed on, however, and the church, from being persecuted or disregarded, gained power and influence, as the Papacy became a civil government and its hierarchy corrupt and overbearing, the conception of antichrist was transferred to the church itself. As early as the eleventh century the opinion had gained ground that in the growing power and ambition of the court of Rome was to be found the rise of the antichrist. This opinion was held by the reformers Ockham, Wickliff, Cobham, Jarrow, Huss, and their followers, and also by the Waldenses and the Albigenses. At the time of the Reformation it became generally accepted among Protestants, and is widely prevalent at the present day. On the other hand, some of the theologians of the Roman Catholic Church have maintained that the appearance of antichrist is to be found in the rise and development of Protestantism, while by the Greek Church the same is believed of Mohammedanism.

ANTICLINAL, a term in geology which expresses the fact that, from a given line, the strata dip in opposite directions; the curves they form having their convexity upwards.

ANTI-CORN-LAW LEAGUE, the name taken by an association formed in 1839 for obtaining the repeal of the corn laws and the furtherance of free trade.

The practice which had hitherto prevailed of imposing heavy duties on all foreign corn imported into Great Britain had caused severe distress to all classes of the community, and for many years previous to the formation of the League efforts had been made to procure an alteration of the law.

Associations to obtain the repeal of these imposts had been formed in several of the towns of England, one being founded in London as early as 1834; but the most influential and important was that formed in October, 1838, in Manchester, which included amongst its earliest members Richard Cobden and John Bright.

The first efforts of this society were so well received that by the month of February in the following year it had obtained upwards of £6000 in subscriptions, and was able to organize a plan of operations which soon attracted general attention. It stimulated the formation of similar associations in all the large towns of the kingdom, and made speedy arrangements to bring its objects before the attention of Parliament. A petition to the House of Commons was drawn up by Mr. Cobden and sent by the Manchester chamber of commerce. Mr. Charles P. Villiers, M.P., who had previously brought in an annual motion for the repeal of the corn laws, undertook to bring the matter before the House, and on the 19th February, 1839, moved "that J. B. Smith, R. H. Greg, and others be heard at the bar of the House by their witnesses, agents, or counsel, in support of their petition, presented to the House on the 15th instant,

complaining of the operation of the corn laws." The motion was rejected by 361 votes to 172. Another, to the effect that the House "should resolve itself into a committee" to take into consideration the laws regulating the importation of foreign corn, which was brought forward on 12th March, 1839, was rejected, after a debate which extended over five nights, by 342 votes against 195.

To support Mr. Villiers in his motion a large number of delegates, representing twenty-two of the manufacturing towns of Great Britain, had assembled in London; and after its rejection a meeting was held on 20th March, at which it was resolved that a permanent union should be formed, to be called the "Anti-Corn-Law League," with a central office in Manchester, and that the sum of £5000 should be raised to defray expenses.

In the following April a weekly publication, entitled the *Anti-Corn-Law Circular*, was issued in Manchester, which soon obtained a large circulation, a staff of able lecturers was engaged, and pamphlets, tracts, and reports of the more important speeches on the subject were circulated in large numbers throughout the country.

In 1841 the cause of the League was greatly assisted by the return to the House of Commons of Mr. Cobden, as member for Stockport, whose intense earnestness, clear logic, powerful and pointed utterance, and complete mastery of the whole subject proved of immense assistance in all subsequent debates on the question. Mr. Bright was not elected a member until July, 1843, when he was returned for Durham. His splendid eloquence soon made him a power in the House, and greatly aided the parliamentary work of the League. Every motion brought forward was, however, outvoted by large majorities; but the work of arousing and awakening the nation was steadily pursued. Large public meetings were called in all the great towns, which were addressed by the leaders of the movement, among whom may be named George Wilson, the "permanent chairman" of the League, Cobden, John Bright, General Perrotet Thompson, C. P. Villiers, B. R. Moore, and the Rev. W. J. Fox, a Unitarian minister. The lecturers of the League visited every place of importance throughout the kingdom, and the work was further sustained by the circulation of millions of tracts and pamphlets, which penetrated to every corner of the land. Of the latter perhaps the most effective was General Thompson's "Catechism of the Corn Laws," in which the principles of free trade were set forth with beautiful clearness and irresistible logic.

Immense sums of money were raised and expended by the League. At its foundation it was decided to place £5000 at the disposal of the central association; in 1842 it was resolved to raise £50,000 for the same purpose. The money was quickly obtained and expended, and the League then asked for £100,000, and obtained in answer to their appeal £123,000. Nearly the whole of this was expended by the close of 1845; but the movement had now assumed such proportions that when, at a meeting held at Manchester, the sum of £250,000 was asked for, upwards of £60,000 was subscribed in an hour and a half, and in a few days the amount promised reached £150,000.

The opinion of the country had now been so unmistakably expressed that the leading statesmen had been gradually converted to the cause of the free traders; and when, in the autumn of 1845, the potato blight threatened the people of Ireland with famine, it was felt that the time had come when all hindrances to the free importation of food must be removed. Accordingly, at the commencement of the following year Sir Robert Peel introduced and carried in the House of Commons a measure repealing the corn laws, which passed the House of Lords and became law in the month of June, 1846.

The work of the League was now accomplished, and at a meeting held on the 2nd July of the same year it was de-

cided to take the necessary steps for closing its affairs with as little delay as possible. Its history forms one of the most interesting studies in connection with the growth of popular government. It was a bold and determined effort to bring into practice certain truths of political economy which, though clearly perceived by students and thinkers, were utterly unknown to the mass of the nation, and were determinedly opposed by nearly the whole of the kind-owners of the kingdom. It worked throughout within the lines of the constitution, and used only those means which were sanctioned by law and order, and its splendid success must ever be a source of encouragement to all who labour for progress and reform.

ANTICOSTI, an island lying in the mouth of the river St. Lawrence. It is 135 miles long by about 40 broad, and is altogether 2000 square miles in extent. The shore on the north side is high, and the water close to the cliff is deep, but there are no harbours; on the south the land is low, and the water shallow. There is a lighthouse on the island, the keepers of which are almost the sole inhabitants. The surface is swampy, and in most parts covered with stunted trees and underwood. Bears, foxes, and sables are numerous, and there are extensive fisheries around the coast. The island was discovered in 1534 by Jacques Cartier, who gave it the name of Assumption.

ANTIDICOMARIANITES (from the two Greek words *ἀντιδωγ*, adversary, and *Μαρία*, Mary), a sect whose belief was that Mary the mother of our Saviour did not continue a virgin after his birth, as the Roman Catholic Church asserts that she did to the end of her life, but bore other children to her husband Joseph.

ANTIDOTES (from two Greek words, *ἀντι*, against, and *δωρις*, given), substances given to counteract the effects of poisons—generally extended to include any means of relief in cases of poisoning.

The selection of appropriate means to counteract the effects of poisons must be determined by a knowledge of the nature in which each particular poison acts; but, as we cannot enumerate or specify these here, we shall give only general rules to this effect. These may be reduced to three, viz. 1, to remove the poisons; 2, to prevent or limit its local effects; 3, to elevate its effects on remote organs, supporting their action by appropriate measures, that the impressions impressed are spread. The first of these is to be accomplished mostly by mechanical means. If the poison has been applied to any external part, as by the bite of a viper or rattlesnake, a cupping-glass, or, if it will answer as well, a wine-glass, tumbler, or cup of any kind, from which a part of the air has been expelled by holding within it a lighted candle for a second or two, should be immediately applied. If the poison has been taken into the stomach, and is not of a kind to arrest instantly the action of the heart, its removal is to be attempted by the stomach-pump, or by exciting vomiting. The stomach-pump must well be used without introducing into the stomach a considerable quantity of water, which, by diluting the poison, lessens its violence in all cases, except that of arsenic acid. The stomach-pump is also to be preferred in the case of uterine poisons, as the insensibility of the uterus to reason prevents the stomach from being affected by emetics. But should a stomach-pump not be at hand, there are to be present skilled in the use of emetics, that should be made to produce vomiting. For this purpose a tablespoonful of flour of mustard, which is easy to be found in every house, may be put into a glass of warm water, and given to the patient; or a single scruple of zinc (white vitriol) dissolved in a pint of distilled water; or ten grains of sulphate of egg, dissolved in half a pint of distilled water may be administered. If the disposition to vomit occurs, it is to be taken the throat with a feather, and pressure to be put on the stomach. Neither opium nor

tartar emetic should be given, as their action is always preceded by much nausea, during which the absorption of the poison is often facilitated.

Where the poison is of a corrosive or irritant nature, instead of losing time in seeking the means of causing vomiting, it is in general advisable to adopt the second rule, and attempt to prevent or limit its local, and thereby its remote effects. To accomplish this, we must ascertain what the poisonous substance was from which the patient is suffering, and must also know how it acts, as upon this depends the success of our treatment. The objects we must have in view are either to dilute, and so weaken it; to supply from an external source the particular principle which the poison would abstract from the coats of the stomach; or, by adding something to it, so change its nature as to render it comparatively or altogether harmless, which last will always be effected if we can succeed in forming an insoluble compound. The first may be done by giving plenty of warm water; and when we know the particular poison, if the warm water can be made the vehicle of an antidote, the second or third object will also be insured. Suppose sulphuric acid (oil of vitriol) has been swallowed, add to the water chalk, magnesia, or soap; the chalk will make, with the acid, sulphate of lime, which being insoluble will do no harm, while, with the magnesia, the acid will form sulphate of magnesia (Epsom's salts), and, with the soap, sulphate of potash both of which are purgative salts, and will by their action on the bowels assist in lessening the inflammation caused by the poison before it was decomposed. So, when sugar of lead (acetate of lead) is swallowed, by giving Epsom salts we form an insoluble sulphate of lead, which will be discharged by the bowels, operated upon by the magnesia, which has been freed from the sulphuric acid. Corrosive sublimate (bichloride of mercury) abstracts from the coats of the stomach the albumen which they contain, by which it is converted into protochloride or calomel; now, if by giving white of egg, which is pure albumen, we supply it with the principle which it would otherwise obtain from the coats of the stomach, we shall preserve these entire. See POISONS.

ANTIETAM CREEK is situated near Sharpsburg, Maryland, United States. On 17th September, 1862, it was the scene of a terrible battle between the Confederates under General Lee and the Federals under General McClellan. About 100,000 men were engaged on each side, and the battle raged with great determination and fury from daylight till dark without any decisive result, but during the night the Confederates recrossed the Potomac. The losses were about 14,000 men on each side.

ANTIGONE, one of the noblest heroines of the Greek mythology. When *Edipus*, king of Thebes, put out his eyes and went into voluntary exile as an expiation for fearful sins unwittingly committed, it was his daughter Antigone who faithfully accompanied him in all his wanderings until, worn out, he died within sight of Athens at Colonus. Antigone's brothers, Eteocles and Polynices, had succeeded to the throne of Thebes on their father's exile, and to them Antigone returned. The kings soon quarrelled, and Eteocles expelled Polynices from the city; the latter, therefore, organized the famous expedition of the "Seven (princes) against Thebes," the subject of one of the noblest plays of *Æschylus*. Polynices and Eteocles died by each other's hands during the attack on the city. Creon, their uncle, assumed the sovereignty, and at once decreed a sumptuous funeral to Eteocles, but denied Polynices burial as an enemy to his country. Antigone herself alone dared to inter her brother's body, incurring the penalty of death thereby. The strife between the two sentiments of family affection and the intense patriotism of the time forms the subject of Sophocles' masterpiece, "*Antigone*." Her previous devotion to her blind father is his theme in the play, "*Edipus at Colonus*."

ANTIG'ONUS, King of Asia, surnamed *Cyclops* or the "one-eyed," originally one of the generals of Alexander the Great, was born about B.C. 382 of Macedonian parents. On the death of Alexander, when the empire was subdivided among his generals, Antigonus obtained the provinces of Susiana, Phrygia, and Lycia, and was declared by Antipater (regent for the infant son of Alexander) general of his forces. The death of Antipater (B.C. 319) opened the way for the foundation of a separate kingdom in Asia, and Antigonus having command of a powerful army seized the opportunity of uniting the Macedonian conquests under himself. He first defeated and killed Enmenes, the satrap of Paphlagonia. Proceeding to Babylon, he compelled Seleucus to take refuge in Egypt, but the other generals of Alexander became alarmed, and a league was formed against him, composed of Seleucus, Ptolemy, Cassander, and Lysimachus. A furious war commenced 315 B.C., and continued several years—extending over Syria, Asia Minor, Greece, and the Levant. It was brought to a close by a treaty, in which the allies surrendered to Antigonus the whole of Alexander's conquests in Asia, or what remained of them, on condition that the cities of Greece should remain free, that Cassander should govern (as president) the European provinces, and Lysimachus and Ptolemy should reign over Thrace and Egypt respectively. The treaty was broken, however, the next year by Ptolemy, who invaded Asia Minor, but was defeated with great loss, involving the destruction of his fleet, by Demetrius (surnamed Poliorcetes, "the besieger of cities"), the son of Antigonus, B.C. 306. After this victory Antigonus assumed the diadem with the title of king, which he also conferred upon his son, and his example was followed by Ptolemy, Lysimachus, Seleucus, and Cassander. War was still maintained between Antigonus and his rivals. After several campaigns, with varying success, the army of Antigonus, consisting of about 70,000 foot, 10,000 horse, and seventy-five elephants, encountered that of the allied kings, under Lysimachus, mustering 64,000 foot, 10,500 horse, with 100 elephants, at Ipsus in Phrygia, in August, 301 B.C., in a decisive battle. Antigonus fell fighting bravely; his army was defeated, and his son Demetrius fled into Greece. Antigonus was eighty-one when he perished. His extensive empire was divided among the victors. He was a brave, able, and successful soldier; but in carrying out his schemes of ambition he was treacherous, merciless, and insatiable. His son Demetrius, though deprived of his possessions in Asia, managed to obtain the kingdom of Macedonia, B.C. 294, but after experiencing many revolutions of fortune ultimately died in captivity.

ANTIG'ONUS GONA'TAS, King of Macedonia, so named from being born at Goni in Thessaly, son of Demetrius Poliorcetes, king of Macedonia; grandson, therefore, of the great Antigonus. The Macedonian throne had been seized by Ptolemy Ceraunus, eldest son of Ptolemy Soter, king of Egypt, driven from that country by his father (B.C. 281). Ceraunus was slain in battle against the Gauls. After the great overthrow of the barbarians in Thessaly, Antigonus defeated another division of them in Macedonia, and soon after gained possession of Macedonia, B.C. 277. After many vicissitudes, during which he was twice expelled from his territories by a hostile force from Epirus, he eventually succeeded in recovering a great part of his father's dominions, and held them in peace during the latter part of his life. He was continually employed in extending his influence in Peloponnesus, and was brought into frequent collision with the Achaean League. [See **ARATUS**.] He died B.C. 243, leaving a son, Demetrius II., who reigned ten years.

ANTIGUA, one of the West India Islands, and a British colony—being the most important of the Leeward Antilles. It is about 21 miles long, and nearly the same

in breadth. It contains much level land, and is not in any part mountainous. The total area is 117,000 acres, of which over 100,000 are cultivated. The shore is in general rocky, and surrounded by dangerous reefs, which make it difficult to approach. There are, however, several excellent harbours, in one of which—English Harbour, situated on the south side of the island—is a dockyard belonging to the government, with every convenience for careening and repairing vessels. The island does not contain a single river, and water for domestic use is very scarce. The chief products are sugar, molasses, rum, arrowroot, and tobacco.

Antigua is divided into six parishes, each of which has a town or village, and eleven districts. *St. John*, the capital, with a population of 15,000, on the north-west side of the island, is built at the bottom of the bay of the same name, which is defended by a fort, and forms an excellent harbour. The town is on the side of a hill, and its streets are in some parts very steep.

Hurricanes are common in Antigua. One which took place in 1818 destroyed many lives and much property. On 8th February, 1843, the island was visited by an earthquake, which destroyed more than half of the churches, principal buildings, and sugar mills. The population in 1881 was 31,961, of whom only 1795 were whites.

The administration is conducted by a president acting under the governor of the Leeward Islands, and a council partly nominated by the crown and partly chosen by the colonists. The public revenue and expenditure is each about £15,000 per annum. The imports average in value from £150,000 to £180,000 per annum; exports from £200,000 to £210,000.

Antigua was discovered by Columbus in 1493. It was first inhabited by a few English in 1632. Subsequently, in 1663, a grant of it was made by Charles II. to Lord Willoughby, who sent out a large number of colonists. After an interval of French occupation, it was declared a British possession by the treaty of Breda in 1666.

ANTI-LIB'ANUS or **ANTI-LEB'ANON**, a mountain range of Palestine, running parallel to and east of Lebanon, the two ranges enclosing the valley of Galilee. It becomes detached from Mount Lebanon about B.C. 34 X., extends southward to nearly opposite where Lebanon terminates, and there subdivides into two chains which bound the valley of the Jordan, the Dead Sea, and the Ghor, to the head of the Gulf of Akabah.

ANTILLES, the name given to the great group of islands in the Atlantic Ocean which lie between the continents of North and South America, and are more familiarly known as the **WEST INDIES**. They are generally treated of as two groups—the Greater Antilles, including Cuba, Porto Rico, Jamaica, and Hayti; and the Lesser Antilles, comprehending the remainder of the islands. The name Antilles is believed to have been applied to the West Indies in error. On the discovery of the group by Columbus it was supposed that he had reached Antilla, a land existing by tradition far to the West of the Azores. This explanation, however, is considered somewhat vague and unsatisfactory, and another suggestion is that the name is derived from the Latin word *ante*, with reference to their position "before" or in front of the American continent.

ANTIMONY. This metal (some compounds of which were known to the ancients) was first isolated and described by Basil Valentine in 1460. It occurs, though rarely, native, and is generally procured from the native trisulphide, which is the only abundant ore of the metal. The ore is converted into oxide by roasting, and the oxide reduced by charcoal; or the sulphide is at once reduced by fusion with a mixture of charcoal and alkali, or metallic iron. Its colour is a silver white, lustre considerable, and the fracture fine laminated when pure; but the antimony of commerce is broad lam-

nated. Its specific gravity is about 6·7, and atomic weight 122. It melts at 450° C. (840° Fahr.), and may be distilled at a white heat in an atmosphere of hydrogen. Heated on charcoal before the blowpipe it burns brilliantly. When slowly cooled after fusion it crystallizes in the octahedron or its varieties. When it is exposed to the air this metal tarnishes. Symbol, Sb. (*stibium*). Antimony forms three oxides.

Antimony Trioxide, or antimonious oxide (Sb_2O_3), found native in shining white crystals. Prepared from antimony by oxidation; it is a white amorphous powder, fusible and volatile at a red heat; it is sparingly soluble in water. It dissolves very easily in tartaric acid or the acid tartrate of potassium, forming tartar-emetie, the tartrate of antimony, and potassium ($\text{C}_4\text{H}_4\text{K}_2\text{SbO}_7$). Trioxide of antimony acts as a weak acid, forming salts termed *antimonites*.

Tetroxide of Antimony, commonly called antimonious acid (Sb_2O_4), is found native as antimony ochre. It is also procured by roasting the trioxide or trisulphide, or by oxidizing metallic antimony by nitric acid. It is white, infusible, slightly soluble in water, more so in hydrochloric acid. It dissolves in alkalis, forming compounds sometimes termed *antimonites*, though these may be more properly regarded as compounds of antimonates containing Sb_2O_5 , with antimonites containing Sb_2O_3 .

Antimony Pentoxide, antimonie anhydride (Sb_2O_5) (combined with water, antimonie acid), forms neutral and acid salts; a dibasic acid termed metantimonie acid also exists. It is a pale yellow powder. Its action on the animal economy is but slight; it is tasteless and insoluble in water. Metantimonie acid dissolves readily in acids, and completely in a large quantity of water; it is unstable, being easily converted into antimonie acid.

Neither nitrogen, hydrogen, nor carbon combine with antimony.

Antimony Trichloride (SbCl_3) is formed with visible combustion when chlorine is slowly passed over antimony in excess in a long tube. It is a soft and nearly colourless solid. At a moderate heat it liquefies, and it absorbs moisture from the air. Thrown into water it is partially decomposed and forms a white powder, formerly employed in medicine under the name of powder of Algaroth.

Antimony Pentachloride (SbCl_5) is formed with brilliant combustion when finely-powdered antimony is thrown into chlorine gas. It is a colourless or slightly yellow fluid, has a strong disagreeable smell, and emits white fumes. It attracts moisture from the air, and when mixed with water is converted into a crystalline hydrate, which quickly spouts up into hydrochloric acid and antimonie acid.

Antimony Bromide (SbBr_3) is formed by direct combination of its elements. Bromide is placed in a retort and powdered antimony shaken into the vapour, when the antimony fires and the compound is formed. At common temperatures it is solid, colourless, crystallizes in needles, attracts moisture from the air, and is decomposed by water. It melts at 90° C., and boils at 270° C.

Antimony Iodide (SbI_3) is formed in like manner. It is a dark-red body, decomposed by water.

Antimony Trisulphide (Sb_2S_3) is the principal ore of the metal, and is found in many parts of the earth. It is of a lead-gray colour, possessing considerable splendour, and is met with in compact in acicular crystals and in rhombic prisms. It is much employed in preparing metallic antimony, glass of antimony, creusot of antimony, James' powder, and some preparations in the London and other pharmacopœias. It is soluble in a hot solution of potash or soda; on cooling an orange-red substance is deposited, called *kermes-mineral*; this was formerly much used in medicine. When an acid is added to the remaining cold solution a further portion of a similar precipitate is formed. This is sometimes called the *golden sulphuret of antimony*,

and in the "London Pharmacopœia" *sulphuretum antimonii precipitatum*. Several other compounds of antimony and sulphur are known.

The only salt of antimony, strictly speaking, of any great importance is the tartrate of antimony and potassium, usually termed tartar emetic, or tartarized antimony—the *antimonium tartarizatum* of the "London Pharmacopœia." Of all the preparations of antimony this is the most valuable. The pharmacopœias also contain a preparation in imitation of James' powder, called *pulvis antimonialis*.

Antimony is capable of combining with all metals. It makes them very brittle. Type-metal is an alloy of lead and antimony containing from 17 to 20 per cent. of the latter. Britannia metal contains about 25 per cent., with equal portions of brass, tin, and bismuth.

Medical Properties.—As antimony cannot produce any effect on the human system unless when so prepared as to be capable of decomposition by the fluids of the body, the tartarized form, being the most soluble, has properly superseded the others. Its action varies according to the dose, the mode of administration, and the state of the system when it is exhibited. In very small doses it seems to increase the activity of the function of secretion, particularly of the mucous membranes; hence it occasions a flow of thin fluid from these surfaces, which form the inner lining of the lungs and intestinal canal, and also an increased action of the skin and flow of perspiration, if the patient be kept warm. In a larger dose it causes vomiting, with all the phenomena of that action; and, from being commonly employed for this purpose, it is designated *emetic tartar*. It is used as an emetic, but should not be given in cases of poisoning, and least of all in cases of narcotic poisons, since in large doses it is itself a poison unless vomiting takes place. It is employed in catarrhal affections, also in fevers and inflammatory diseases, on account of its sedative action on the heart.

ANTINOMIANISM (Gr. *anti*, against, and *nomos*, law), the doctrine that faith in Jesus Christ dispenses with and renders unnecessary the observance of the moral law. A tendency to this perversion of the doctrine of justification by faith appears to have manifested itself at a very early period, and it is referred to several times in the apostolic epistles. The Gnostics appear to have been largely affected with this error, and it has been charged against several of the sects which arose during the mediæval period. The name was first applied to the opinions of John Agri-cola, a contemporary of Luther, who in 1537 publicly maintained in a disputation at Wittenberg that "as men are justified simply by the gospel, the law is in no way necessary for justification or sanctification." In the controversy with Agri-cola, Luther took a very active part; and in 1540, by the aid of the Elector of Brandenburg, he compelled Agri-cola to retreat. Similar views, however, were maintained by some of the sects of the Anabaptists, and in 1648 some severe laws were passed in England against all those who held these opinions. Where there has been any fanaticism connected with the adoption of antinomianism it has generally led to great licentiousness; but it must be noted that opinions very similar to those described have been held by men who have yet lived moral and religious lives. As a question of speculative theology it came to the front several times during the evangelical revival of the last century, but it never assumed any importance, and the term has now only an historical application.

ANTIN'OUS, a native of Bithynia, probably of plebeian origin, favourite of the Emperor Hadrian, the extravagance of whose attachment was shown by the institution of divine honours to Antinous after his death. Respecting the circumstances of his death there are many stories; but it seems generally agreed that he was drowned in the Nile while Hadrian was in Egypt. The town near which he died was rebuilt by

the emperor, and called *Antinos* or *Antinopolis*, instead of *Besa*, its former name; and temples were built to the new god both in Egypt and Greece. The grief of the emperor knew no bounds. A new star, which was said to have been then discovered, was called "the Soul of Antinous," and still bears his name. Among the remaining treasures of ancient sculpture the busts and statues of Antinous, which are numerous and very similar to each other, rank among the most beautiful. That originally in the collection of Cardinal Alexander Albani is a standing figure in marble. The head looks downwards, with a melancholy expression, which indeed they all bear; the hair, as in all of them, covers the forehead nearly as low as the eyebrows.

ANTIOCH (vulg. *Antakia*), properly Antiocheia, a town and ancient capital of Syria, on the left bank of the Asy, the ancient Orontes, 20 miles from the sea, in $36^{\circ} 11'$ N. lat., $36^{\circ} 8'$ E. lon.

Antioch belongs to the pashalic of Aleppo. It stands in the valley of the Orontes, which here forms a fertile plain, about 10 miles long and 5 or 6 broad. On the W. side of the river is part of the mountain range of Amanus, and on the E., to the S. of Antioch and bordering close upon it, is the northern termination of the mountains called *Jebel Akra*, the ancient *Casius*. The river at Antioch is from 100 to 150 feet wide, and is crossed by a substantial bridge, having two towers with iron-plated gates, from which the bridge is known as the iron bridge. A large part of the immense walls of ancient Antioch still remain. It seems not unlikely, from the quantity of Roman tiles found in the towers, and the mode of their disposition, that they are chiefly Roman work; and it is probable that the walls are those erected by Justinian, after the town had been ruined by the Persians.

Antioch is still one of the large towns of Syria. The population, which in ancient times numbered 400,000, is now, however, only about 16,000. It shows few traces of its ancient grandeur. The houses are chiefly built of stone, pent-roofed, and covered with red tiles. The streets are narrow, with a raised pavement on each side for foot passengers. The manufactures are coarse pottery, cotton cloth, silk twist, leather, and saddlery; but the chief industries are the cultivation of silk and tobacco.

Antioch was the most magnificent of the sixteen towns of the same name founded by Seleucus Nicator, and was so called after his father Antiochus. There was, however, a town previously existing, which is said to have been named *Riblah*. Antioch became the residence of the Syrian kings, and one of the largest cities of the world, the principal street running from east to west a distance of 4 miles. It probably grew still larger under Roman dominion, when it was the residence of the governor of Syria, the seat of pleasure, and the centre of an extensive commerce, its harbour being at Seleucia, on the sea-coast. The beautiful climate attracted wealthy Roman visitors, and the vice and frivolity of the inhabitants rendered it the most debased of the Greek cities of the East. Strabo (p. 750) describes Antioch in his time as consisting of four distinct quarters, each having a wall of its own, and the whole surrounded by a common wall. The geographer says it was little inferior in extent and wealth to Seleucia on the Tigris and Alexandria in Egypt. Under Libanius, a native of the place, it became in the fourth century a celebrated school of rhetoric. But before this period Antioch had also become the chief seat of the Christian religion, and it was here that the name Christian was first given to the disciples. Ten church councils were held here in the third and fourth centuries.

Antioch continued to be a city of great importance, notwithstanding the frequent earthquakes, till Chosroes the Persian nearly levelled it with the ground. It was rebuilt by Justinian, and again became a considerable place, and

continued so till the time of the Crusaders. After it was taken by the Crusaders under Godfrey and Boemond (A.D. 1098), it became a Christian principality under the European conquerors of Syria. The Sultan Bibars, in 1269, took it from the Christians and destroyed its churches; and even now, from the absence of any other place of worship, the Christian community is compelled to make use of some of the numerous excavations near the town, which were probably intended for catacombs. It afterwards passed under Turkish dominion, but has never recovered its commerce and importance, which were transferred to Aleppo. Antioch was taken possession of by Ibrahim Pasha, 1st August, 1832, but was subsequently restored to the Porte.

In 1872 an earthquake took place at Antioch, by which more than 2800 out of the 3000 houses in the town were either thrown down or damaged, and more than 500 persons killed. The town has since been rebuilt, but on the principles which unfortunate experience has already shown to be best calculated to insure the greatest loss of life in the probable event of another earthquake.

ANTIOCH IN PISIDIA, in Asia Minor, was situated, according to Hamilton, in $38^{\circ} 18'$ N. lat., $31^{\circ} 23'$ E. lon. The ruins were discovered by Arundel in 1833, and are described in his "Discoveries in Asia Minor." This is the town in which St. Paul, accompanied by Barnabas, preached the gospel, as mentioned in Acts xiii. The principal remains consist of the piers and arches of a magnificent aqueduct which conveyed water to the town, and of the walls and foundations of temples and churches and a small theatre. The site, an elevated plateau, is strewed over with huge blocks of marble, broken columns, highly finished cornices, and other indications of the former architectural grandeur of the city. Antioch was not actually in Pisidia, but in Phrygia, and is called by Strabo "Antioch near Pisidia" (Strabo, p. 569, 517, ed. Casaub.) The ruins of Antioch are about a mile and a half from the town of Yalobatch.

ANTIÖCHUS, a name best known from its being borne by thirteen Syrian monarchs of the Seleucid dynasty, by four kings of Commagene, a country lying between Mount Taurus and the Euphrates, and by many other men of note. The name was a common Greek one.

ANTIOCHUS of Ascalon, was a Greek philosopher, a pupil of Philo, and successor to that distinguished philosopher as head of the New (5th) Academy during the first half of the century before Christ. Brutus and Cicero were among his pupils, and the latter frequently speaks of him in the highest terms.

ANTIOCHUS SOTER (or "Preserver") was the son of Seleucus Nicator (or the "Conqueror"), who, after the death of Alexander, raised Syria into an independent kingdom. Upon the murder of Seleucus by Ptolemy Ceraunus, during an expedition to secure the crown of Macedonia (B.C. 280), Antiochus succeeded to the throne, and reigned nineteen years. He prosecuted his father's claim to Macedonia against Antigonus Gonatas, son of Demetrius, who was his brother-in-law; but the dispute was accommodated by a marriage between Antigonus and Phila, half-sister of Antiochus, in consideration of which the Macedonian prince was allowed to retain the peaceable possession of his throne. Demetrius, the son of Antigonus, also married Stratonice, the daughter of Antiochus. Antiochus defeated the Gauls, who had crossed into Asia and settled in Galatia, but fell in the battle B.C. 261.

ANTIOCHUS THEOS (or "God"), son of Antiochus Soter, succeeded his father. He was so named by the grateful citizens of Miletus, whom he delivered from the despot Timarchus. The Parthians, B.C. 250, under Arsaces, expelled the Macedonians from their country, and Arsaces became the founder of the Parthian empire.

Bactria and other provinces east of the Tigris followed this example; and Antiochus, apprehensive of the final loss of those regions, concluded a treaty of peace with Ptolemy Philadelphus, king of Egypt, B.C. 252, by which he agreed to repudiate his wife Laodice, and to marry Berenice, daughter of Ptolemy. These conditions were fulfilled; but on the death of Ptolemy, two years afterwards, Antiochus restored Laodice to her conjugal rights. Her first act was to poison Berenice and also Antiochus, B.C. 247, with the view of securing the succession to her eldest son, Seleucus Callinicus.

ANTIOCHUS THE GREAT, King of Syria, the most illustrious of the dynasty of the Seleucidae (so called after its founder Seleucus I., one of the generals of Alexander the Great), was the son of Seleucus Callinicus, and succeeded his brother Seleucus Ceraunus at the age of fifteen, B.C. 223. He recovered some of the provinces which had been detached from the kingdom during the reign of his predecessors, and engaged in war with Ptolemy Philopator, who held Palestine and Coele-Syria. He was successful at first, and recovered Damascus, penetrated into Phoenicia, and gained possession of Galilee and the tracts east of Jordan; but in the year 219 B.C. he met with a severe defeat in a great battle fought near Gaza, and was compelled to retire to Antioch, and resign his claim to the contested provinces. He next turned his arms against the Parthians and Bactrians, and in a war which lasted seven years gained such successes as gave him the title of "Great."

He then renewed the war against Egypt, in league with Philip of Macedonia, and in two campaigns regained possession of Palestine and Coele-Syria, being assisted in this war by the Jews, on whom he conferred many privileges. He continued his conquests, and in the year 196 B.C. took possession of the Thracian Chersonese, but in doing so brought himself into collision with the Roman power. He concluded a peace with Egypt, and married his daughter to Ptolemy Epiphanes, giving her Palestine and Coele-Syria (which at last he had succeeded in conquering) as her dowry. In B.C. 195, Hannibal, driven from Carthage, sought his protection, and induced him to match his strength against the power of Rome. In the winter of 192 he crossed over into Greece with his army, but in the following year the Roman consul Acilius Glabrio completely defeated him at Thermopylae, and he was compelled to retire to Asia. He was followed by the Romans under Scipio, and another battle was fought B.C. 190 near Sipylus, in which he was defeated with immense slaughter. He then submitted to the terms offered by the Romans, but in his efforts to raise the enormous indemnity of 15,000 Euboic talents demanded, he was led to plunder a wealthy temple in Elymais, in consequence of which the people rose against him, and he was killed with his attendants B.C. 187, in the thirty-seventh year of his reign and fifty-second of his age. He was succeeded by his son Seleucus Philopator.

ANTIOCHUS IV., King of Syria, surnamed by himself *Epiphanes*, or the Illustrious, was given by his father Antiochus the Great as a hostage to the Romans. He was set at liberty and succeeded his brother Seleucus Philopator B.C. 175. He overran Egypt, and gained possession of Ptolemy Philometor, the young king; but the Romans stopped his further conquests, and compelled him to return to Syria. He persecuted the Jews with the greatest cruelty, and defiled the temple at Jerusalem by setting a statue of Jupiter Olympius in the holy place. His wanton cruelty and tyranny excited the heroic resistance of the Maccabees, who, during the remainder of his reign, kept him in a state of continual alarm. To oppress them he sent a force under Lysias into Judæa, who was totally defeated. Inflamed with passion, he

hastened towards Antioch, leaving the northern provinces, where he was engaged in quelling a revolt. He was attacked on the way by a painful and loathsome disease, and died raving mad at Tabæ, in Persia, in 164 B.C. From his wanton cruelty and tyranny he was surnamed by his subjects (in mockery of his title *Epiphanes*) *Epimanes*, or the Madman. His painful death was regarded by both Jews and Greeks as a special judgment of God.

ANTIOCO, ST. ISOLA DI, an island on the south coast of Sardinia, anciently named Malibodes, and connected with the mainland by a Roman bridge and causeway. It contains ruins of the Carthaginian town Sulci, and is 8 miles long by 3 broad. Population, 4000.

ANTIPAROS, called by the ancients *Oleuros*, one of the group of the Cyclades, is situated between Siphnos and Paros, and separated from the latter by a dangerous channel a mile and a half wide. It is 7 miles long by 3 broad, and contains one small village with about 500 inhabitants, whose chief occupation is fishing. Its products consist only of poor wine, and a little cotton and barley. The island is a mass of white marble, and is celebrated for its grotto, the entrance to which is by a low arch formed of rough craggy rocks, about 30 paces wide, and divided into two by natural pillars. The grotto, which is reached after several passages and descents, is 120 yards long, 113 wide, and 60 feet high. It is an immense arch of white marble, from the roof of which depend large stalactites, 10 feet long and as thick as a man's waist, with festoons and leaves of the same substance; the floor is rough and uneven, with various coloured crystals and stalagmites rising up; and in the midst is one 20 feet in diameter and 24 feet high. When lighted up the whole presents a most brilliant and magnificent scene. This cavern, although not mentioned in the works of ancient writers, is believed to have been known to them. It was not, however, until 1673 that it was discovered to the modern world by the then French ambassador to the Porte.

ANTIPATER, one of the generals of Alexander the Great, and eventually regent of the empire for his infant son. He was a Macedonian of high birth, and a pupil and friend of Aristotle. When Alexander left Europe for Asia he intrusted the government of Macedonia and the regulation of Greece to Antipater, who discharged his trust with conspicuous ability. In B.C. 331 he had to encounter an organized insurrection against the Macedonian rule in Thrace, which he completely suppressed, and subsequently conducted a successful war with Sparta.

He became, however, the object of the jealousy of Olympias, the mother of Alexander, and owing to her influence he was ordered to resign the government of Macedonia to Craterus, and to conduct a body of fresh troops to Babylon. The death of Alexander prevented the carrying out of this arrangement, and in the distribution of the vast empire into provinces on the model of the Persian satrapies, Antipater was confirmed in the government of Macedonia and the adjacent countries. A powerful confederacy, however, was soon formed by many of the Grecian states, having for its object the liberation of the cities of Greece which were held in subjection by Macedonian garrisons, and Antipater was twice defeated by the allied forces. He was then assisted by Craterus, who had arrived from Asia at the head of 12,600 veteran troops, and after another battle, which was fought at Crannon B.C. 322, in which neither side gained any decisive victory, he contrived to break up the union of the opposing states, and to reduce them to subjection.

He abolished democracy at Athens, quartered a garrison at Munychia, and ordered the leaders of the popular party to be delivered up to him. Among these was the orator Demosthenes, who, when summoned to appear, took poison, and died in the temple of Poseidon, 322 B.C.

Antipater was next engaged in war with the regent Perdiccas, who aspired to become the successor of Alexander, but who was murdered in Egypt B.C. 321, and Antipater was appointed by the Macedonian troops to the office of regent in his place. In this new capacity he made a fresh distribution of the provinces, and returned to Macedonia, taking the young king Alexander, and his queen Egeus, with him. He died 318 B.C., in his eighty-first year, and though he had a son Cassander, he left the regency to Polysperchon, one of the oldest of Alexander's surviving generals.

He was a man of great ability, both as soldier and governor, a friend and patron of learning, and his character is less stained by cruelty than that of most of those who contended for empire on the death of Alexander.

ANTIPATER, son of Antipas, the governor of Idumæa, was himself a native and governor of that province during the high-priesthood of Alexander Jannæus. After the death of that prince, his sons, Hyrcanus and Aristobulus, disputed the succession. Antipater was a zealous partisan of Hyrcanus, who, after a bloody contest, was established in the high-priesthood by Pompey the Great; and Antipater ruled in Judæa in the name of his weak master. Cæsar, during the siege of Alexandria, received aid from Antipater, and in return he appointed him to the administration of Judæa. Antipater was poisoned by a Jew named Malchus, B.C. 49, through jealousy of his influence with Hyrcanus. Antipater left four sons, of whom two are known in history—Phasael, governor of Jerusalem, and the infamous Herod, king of the Jews.

ANTIPATHY (from the Greek *ἀντίπαθος*, compounded of *ἀντί*, contrary, and *πάθος*, feeling) properly signifies an involuntary dislike or aversion entertained by individuals towards things harmless or even agreeable to the majority of mankind. In some cases such feelings may be overcome by habit—as for instance, the feelings of loathing which many persons feel at the sight or touch of spiders, earwigs, toads, &c., soon disappear when any of them are studied for a scientific purpose; and antipathies excited by disagreeable smells such as arise from many drugs, or which generally attend a dissecting-room, will pass away when the person becomes accustomed to them, so that they are scarcely noticed at all. A familiar illustration of this may be found in connection with the use of cod-liver oil as a medicine, which generally excites aversion at the outset, but when persisted in frequently becomes palatable, and is relished by the patient. Some forms of food that are eaten with a relish by certain nations (as whale blubber and train oil by the Esquimaux) are utterly distasteful to strangers.

There are, however, antipathies which arise from some natural peculiarity of the constitution, and when they are disregarded are followed by consequences of a painful and distressing kind. Thus some persons have a strong aversion to some particular kind of food, as veal, pork, cheese, or eggs, and they find that if they can conquer the aversion so far as to partake of the food disliked, it is resented by the digestive economy, and nausea, vomiting, and even symptoms of poisoning may become apparent. The same law applies to the influence of drugs upon the body, and medicines that are useful in the majority of cases may be dangerous or even poisonous to certain constitutions.

Still more remarkable are the antipathies excited by sight or hearing, of which many instances are recorded in historical and medical works. Thus Anne of Austria, the wife of Louis XIII. of France, though passionately fond of flowers and perfumes, had so strong an antipathy to roses that she could not bear to see even the picture of one; and it is recorded that Henry III. of France fainted at the sight of a cat; while Tycho Brahé, the astronomer, had a

similar experience at the sight of a fox. Hearing the creaking of a wheel has been sufficient in some cases to cause fainting, and a case is recorded by Zimmerman of a lady who swooned at the touch of anything smooth, such as satin or velvet.

ANTIPHLOGISTIC, a term used in medicine to designate the remedies used against febrile action and inflammation. In a state of health the temperature of an adult is about 98.4° Fahr., but in fevers this is much exceeded, and it may rise to 101°, 102°, 103°, or even higher, sometimes reaching 106°. Such increase is always attended with great constitutional disturbance, and when it reaches an extreme degree generally terminates fatally. It has been found that certain drugs have the effect of reducing the temperature, and such remedies are largely used in medical practice. Among these are the salts of antimony and mercury, acetate of ammonia, squills, camphor, and opium. Other means employed are bleeding, low diet, and purgatives.

ANTIPHON, the son of Sophilus, the oldest of the Athenian orators who are generally known under the denomination of the "ten," belonged to Rhamnus, a *demus* or township of Attica, and was born about B.C. 489. He opened a school of rhetoric, and numbered among his pupils Thucydides, the historian of the Peloponnesian War, who, in a passage of his eighth book, has commemorated the talents of his master. It was the profession of Antiphon to write speeches for persons who had either to defend themselves in courts of justice, or wished to proceed against others, and also for those who had to address the public assemblies. Fifteen of these still remain; the best edition is that of Mätzner (Berlin, 1838). In the year B.C. 411, and in the latter part of the Peloponnesian War, a revolution was effected by which the Council of Five Hundred was abolished, and all political power was vested in a body of Four Hundred. Antiphon was the real author of the revolution, and Pisander, who appeared as spokesman, was merely his agent. Shortly after this change, Antiphon and Phrynichus, with ten others, were sent to Lacedæmon to make peace, but they returned without effecting their object. Discontent grew stronger; Phrynichus was assassinated, a counter-revolution was effected, and Alcibiades was recalled. Antiphon, now seventy years of age, was tried for his life on a charge of treason to the state. He made an admirable defence, now unfortunately lost. His sentence (according to the decree quoted by Cæcilius in the "Life of Antiphon," attributed to Plutarch) was death; his property was confiscated, his house was pulled down, and the site was marked by stones bearing the inscription "Antiphon the Traitor." Antiphon, says Thucydides, was inferior to no Athenian of his time in virtue; he had also the greatest talents for conceiving any plan, and equal talent in expressing his conceptions. Thucydides says nothing about the sentence or the death of Antiphon.

ANTIPHON, a short sentence sung in the Roman Catholic service, in plain-song, or ecclesiastical chant, before the psalms for the day; varying according to the season and festival, &c. Sometimes, but very rarely, used as nearly equivalent to our ANTHEM.

ANTI-PHONAL playing or singing really means playing or singing in octaves, according to ancient Greek use, and the true meaning of the word; but in the dark ages it came to mean the Hebrew system of chanting by responsive choirs, first practised by Christians at Antioch, introduced thence into Milan by St. Ambrose (374), and now the almost universal method of chanting the psalms.

ANTIPODES, a term from the Greek, meaning literally those who stand feet to feet, as is the case with the inhabitants of two opposite points of the globe. Previous to the establishment of the rotundity of the earth, and

during the centuries of discussion which took place upon this point, the existence of antipodes was the theme of constant ridicule in the mouths of the opposers of the globular figure.

Two *antipodal* points of the earth have the same number of degrees of latitude, one north and the other south, unless one of the points be on the equator, in which case the antipodal point is the opposite point of the equator. Their longitude differs by 180° or 12 hours, if we reckon longitude all round the globe; but if we use east and west longitude, the two longitudes must together make up 180° or 12 hours, one east and the other west. We here insert, in opposite columns, the names of a few places which are nearly antipodal.

London, . .	Antipodes Island, S.E. of New Zealand.
Naukin, . .	Buenos Ayres.
Bermudas, . .	Swan River.
Quito, . .	Middle of Sumatra.
Azores, . .	Botany Bay.

Antipodal places have the same climate, so far as that depends merely on latitude, but have the seasons and the days and nights completely reversed. Thus, noon of the longest day at the Bermudas is midnight of the shortest day at the Swan River. The remark as to the seasons, of course, does not apply to antipodal places on the equator.

ANTIPOPE, a name given to a pontiff elected by political or religious factions in opposition to the pope canonically chosen. The first antipope is by some recognized in Novatian, who insinuated himself being chosen to the Roman bishopric, A.D. 252, in opposition to Cornelius; while others reckon the first from Laurentius, who was elected A.D. 398 in opposition to Symmachus. The possession of the chair of St. Peter has very frequently been a source of acrimony and fierce contention, and the rivals elected to the office have not hesitated to excommunicate each other, and have stooped to outrage and cruelty in the pursuit of their claims. In 1046 there were four popes contending for the office, in the persons of Sylvester III., Benedict IX., Gregory VI., and Clement II. The German emperors several times set up popes in opposition to those who had been elected at Rome, and their example in this respect was followed at times by the kings of France and Sicily. In 1378 the whole Catholic world was divided on the subject, and while France, Spain, Savoy, and Scotland recognized Clement VII., who had been elected by the French cardinals at Avignon, the rest of Europe maintained the claims of Urban VI., who had been elected at Rome. Men hoped that when Urban died Clement would be universally accepted, but the Italians elected Boniface IX. Clement had returned to Avignon, resuming the line of French popes which had reigned there from 1309 to 1377, and to stop which had been the motive of the election of Urban, a pope pledged not to quit Rome. When Clement died the French elected Benedict XIII., but with a vow that he would resign if Boniface of Rome would also resign, so that a fresh pope might be chosen. In 1404 Boniface died, and his successor Innocent VII., and in 1405 Gregory XII., on Innocent's death, were elected at Rome under precisely similar vows of ready resignation, if also Benedict of Avignon would resign. A solemn farce was played by Gregory and Benedict for some time, in preparations for a meeting which each was determined should not take place; and eventually Christendom, worn out by the long schism, deposed both popes at the Council of Pisa, and elected Alexander V. He dying, John XXIII. was elected as what we might call the church pope, in 1410—both the Roman and the French popes still continuing to assert their sovereignty. But John proved so bad a pope that he was deposed at the Council of Constance in 1416, and Martin V. elected. Meanwhile

Gregory of Rome, old and deserted, died; and Benedict of Avignon was driven into Spain, where, although he lingered till 1423, he possessed not a shadow of power.

This was the last great schism, lasting over fifty years, and occasioning many serious disasters. There was afterwards an antipope, Felix V., elected at Basle in 1431, but his schism, never of much importance, ceased with his submission a few years later.

ANTIQUARIES, SOCIETY OF. In 1572 a few eminent scholars, under the auspices of Archbishop Parker and Sir Robert Cotton, united their efforts for the preservation of the ancient monuments of their country. This society admitted members till 1604; about which time King James I. thought fit to dissolve it. In 1707 a number of gentlemen, attached in a similar manner to the study of our national antiquities, agreed to meet weekly for the same purposes as the former society.

In 1717 the members reformed, or rather reconstituted, their society, and made their first election of officers. The minutes of the society begin 1st January, 1718; whence it appears that the members, or those who were admitted to be present, brought from time to time whatever they had of their own, or their friends', that was curious or uncommon, as coins, medals, seals, intaglios, cameos, manuscripts, records, rolls, genealogies, pictures, drawings, printed books, extracts, or even memoranda; a few produced dissertations. In 1750 it was unanimously resolved to petition the king for a charter of incorporation on the plan formed in 1717, with improvements. This was obtained in the following year, when His Majesty having declared himself "founder and patron," the society became incorporated by the name of "President, Council, and Fellows of the Society of Antiquaries of London."

The Scottish Society of Antiquaries was founded in 1780. It collected a valuable museum in Edinburgh, which is now national property. The Royal Irish Society was chartered in 1786. There are similar associations in the principal European countries, and the societies of Paris and Copenhagen have done excellent service to the study of history.

ANTIQUES. This term properly refers to works of Grecian art in sculpture, bas-relief, engraving of gems, medals, &c. As these arts flourished in the states of Greece and also under the Roman empire (though successfully cultivated chiefly by Greeks even in purely Roman times), it is not possible to find any precise chronological limits that shall determine whether a work of art belongs to the *antique* or not. Still, as there was under the Roman empire a great and progressive deterioration in the arts, it is clear that many works of considerable antiquity cannot be classed under the head of *antiques*; for by that term we understand works that have decided merit, and may serve as models for imitation; or at least works of art that serve to illustrate the principal ancient authors.

ANTISCORBUTICS is the name given to the remedies used against scurvy, either for its prevention or its cure. The term scurvy is sometimes incorrectly given to those various affections of the skin which are more or less connected with a scrofulous constitution; in which, owing to the disordered functions of the digestion, emptiness and desquamation of the skin arise. The true scurvy is a disease brought on by the continual use of a dietary deficient in fresh vegetables, or such articles of food as will exercise a similar influence upon the body. It occurs mostly at sea, and is sometimes from this designated the sea-scurvy; but it is not confined to the sea, and at times it has made great ravages in inland districts, though in all cases the cause has been found in the want of proper vegetable food. This disease formerly prevailed to such a degree that many medical writers regarded it as being more destructive to

human life than any other complaint known. Commodore Anson, in the course of his voyage round the world, lost above four-fifths of his men from this cause; and when he arrived at Juan Fernandez, of the 200 men then surviving eight only were capable of duty. Its ravages several times seriously imperilled the efficiency of the British navy, and cases have been known in maritime history where an entire crew have fallen victims to it, and the ship has been left without a single hand to guide it through the waters. This happened in the case of the Spanish ship *Oriflamme*, in which the whole crew perished, and in this state the vessel was discovered with the dead bodies on board. During the Crimean War the allied armies suffered terribly from this disease, and it prevailed to a serious extent in the army of the United States during the civil war. It was again brought prominently before the public mind, by its outbreak in the British Arctic expedition of 1876.

The usual symptoms of this disorder are, first, a want of natural and healthy colour; the skin, first of the face and afterwards of the rest of the body, becomes pale and sallow, and the lips acquire a greenish tinge. There are pains in the limbs similar to those caused by rheumatism, and the patient becomes weak and disinclined for exertion. After a time spots of a red, blue, or black appearance are noticed upon the legs and arms, the skin becomes dry, and frequently scales off in flakes. As the disease progresses the face and limbs become puffed and swollen, ulcers or any sores, cuts, or scratches bleed profusely and cannot be healed. Old sores break out anew; and broken limbs, apparently firmly united, separate again and cannot be joined so long as the disorder continues. The gums present a peculiar appearance, becoming spongy and swollen often to such an extent that the teeth can hardly be seen, while the teeth themselves become loose and sometimes drop out. The breath is short and laboured, all exertion becomes difficult, and the sight is often much affected.

With regard to the treatment of this disease the only effectual method is found in the administration of fresh vegetables, and in the use of vegetable acids. By the timely employment of these remedies the disease may be checked at the outset, and they often prove sufficient to overcome it when it has made very great progress. Of all the remedies for scurvy the most effective is found in the juice of the lime fruit, and since its introduction in the British navy the disease has almost disappeared. Every British ship is compelled to take a certain quantity of lime juice, according to the number of the crew and the length of the voyage, and its use is begun about a fortnight after leaving port. In the royal navy each man is allowed one ounce daily, with an ounce and a half of sugar, and it is generally taken mixed with the grog or an allowance of wine, which in some instances is granted instead of the spirits. This has the effect of almost invariably preventing scurvy affecting any of the crew; but if symptoms of the disease begin to show themselves, the quantity of lime juice is increased and they quickly disappear. In the merchant service, although every ship is required under penalty to take a sufficient supply of lime juice and to issue it to the crew during any long voyage, the law is frequently evaded, and the disease is consequently far more prevalent than it need be. For the sake of a small saving some shipowners substitute a cheap imitation made of tartaric acid, sugar, and water, of little or no use as an antiscorbutic. When, in addition to this neglect, the crews are supplied with returned navy stores and other food of the most inferior description, scurvy frequently appears, and sometimes causes intense suffering and even loss of life. Some shocking cases of this kind were brought to light by Mr. Pilmsoll, M.P., in his efforts to obtain the

protection of the legislature for the sailors of the merchant service; but that such practices are still prevalent is evident from the fact that at the Dreadnought Hospital for sailors about ninety cases are treated annually for this disease.

In addition to lime or lemon juice most fresh vegetables and fruits are valuable antiscorbutics. Oranges, apples, grapes, tamarinds, cabbage, potatoes, onions, lettuce, mustard and cress, dandelion, sorrel, and water-cress all possess valuable properties in this respect. Citric acid, tartrate, or citrate of potash are also useful for warding off scurvy; and dried vegetables, with the exception of peas and beans, are also of value, though they will not take the place of fresh ones.

ANTISEPTICS (from *anti*, against, and *septikos*, from *seponai*, to putrefy), the means of preventing those changes in organized matter which are comprehended under the term putrefaction.

As the operations of nature in regard to organized matter seem to consist in reducing to their elementary state each individual or part, when it ceases to live, and in reconstructing other organized bodies, it forms an important subject of investigation to inquire in what way the former of these may be prevented, when it is desirable to preserve the whole or a part of organized matter from putrefaction; by what means can the tendency to putrefaction be so modified that the result of it, though leading to the formation of a substance having a very different character, shall yet be of a kind which may be preserved for a longer period than the original substance. These inquiries concern the preservation of food, so that the produce of a period of plenty may be stored up as a provision for a time of scarcity, and the superabundant productions of one country may be transmitted in a sound and wholesome state to a distant land. It also concerns the provisioning of our ships, so as to insure the health of the crews, so far as depends upon a proper supply of animal and vegetable diet.

All organized substances do not putrefy with equal rapidity, nor under all circumstances. Decomposition goes on fastest in substances which contain nitrogen, most slowly in substances which contain carbon; hence animal matters putrefy quickly, vegetable, especially of a woody texture, gradually. The conditions necessary for putrefaction to take place are, the presence of air, a certain temperature, and moisture. The growth of living infusorial organisms holding a very low position in animal or vegetable life, called "vibrios" and "bacteria," is now recognized as an invariable accompaniment of the process; and if the conditions are such that these organisms are excluded, or their growth and propagation prevented, putrefaction cannot take place.

The natural modes to effect this end are by abstracting or excluding one or more of the chief agents—heat, moisture, and air; the artificial comprehend those methods of preparation or mixture which produce some chemical change in the substance which destroys the life of the putrefactive germs.

The presence of heat is essential to the life of all living organisms; abstracting it therefore checks or suspends their vitality. Most articles of food keep better in cold than in warm weather. When the heat has been so completely abstracted that the juices are frozen, i.e. become solid, the preservation of the substance is more effectually accomplished. Indeed they may thus be preserved for many years, perhaps ages.

On this principle the Russians preserve their poultry, which they kill in October, and pack in tubs with layers of snow between. The markets of St. Petersburg are supplied with veal brought from a great distance in this state, as well as with whole hogs, sheep, and fish. The Canadians preserve their provisions in the same way.

Precaution is necessary in thawing them, or putrefaction may begin on the outside before the interior is thawed; for this end they should be put into cold water, or exposed to a current of air but little above 32° Fahr. Indeed, in the case of persons buried in the snow, recovery is much more likely to be brought about by plunging the individual into cold water than by placing him in a warm bed.

Meat imported into the United Kingdom from the United States, Canada, and New Zealand is preserved during the voyage by a special refrigerating process.

The presence of a certain amount of water is imperative for the sustenance of the bacteria and vibrios. The abstraction of moisture by heat is employed in drying fish and other animal substances, as beef, bacon, &c., though in these the rapid tendency to putrefaction makes the employment of a certain quantity of salt, &c., necessary, along with the drying, unless the process be carried on with great rapidity, which may be effected by a high temperature and a free circulation of air. Hence in many places where turf or wood is burnt, hams are hung within the wide kitchen chimney. Drying is also employed for the preservation of vegetable substances, such as grain, hay, &c. It is by this means that botanists preserve plants to form a *herbarium siccatum* or herbarium, and many plants are thus preserved for medical use; but for this purpose a high temperature should never be applied, as it dissipates their active principles.

The exclusion of sources of oxygen gas constitutes another means of preventing or checking putrefactive fermentation, if the germs have been first killed by exposing the matters to be preserved to a sufficiently high temperature to kill all of them before excluding the air, otherwise the exclusion is of little avail. In the case of foods enclosed in a protecting shell or skin, it is sufficient to prevent any germs which may have attached themselves, and to coat their outside with an impenetrable pellicle. B. *canaliculatus* varnished some eggs, and found that at the end of two years they were yet capable of producing chickens; and B. *canaliculatus* mentions in instance where three eggs were packed within the walls of a church in the Milanese, and when found at the end of 300 years they had not lost their vitality. Lime-water is a good medium in which to place eggs for long keeping. But more valuable articles than eggs are preserved by exclusion of air and putrefactive organisms, and in a condition nearly equal to their fresh state. We allude to the method of preserving animal food and vegetables first promulgated by M. Appert, and which has since developed into the gigantic trade in canned provisions of all kinds which is carried on in all parts of the world. This consists in boiling the articles (if meat the bones must be first taken out) to nearly as great a degree as if intended for immediate consumption; they are then put into jars or tin canisters, which must be completely filled with a broth or jelly prepared from portions of the same meat. The jars are then sealed and covered with a luting, and the canisters carefully soldered down. After this they are placed in a boiler of cold water, to which heat is then applied till the water boils, and the boiling of which is continued for an hour; the fire must then be instantly extinguished, and the water poured off; the boiler must not be uncovered, or the canister taken out, for one or two hours after. The usual means, however, by which the meats, food, or vegetables are preserved in tins consist in expelling the atmospheric air or other gases from the various ingredients to be preserved. This is effected in the following manner: The meat, &c., having been nearly cooked, is put into the canister and filled up with the gravy; the top of the canister is then soldered down, and a very minute needle-hole made in the centre of it. The canister is then placed so that the contents may be brought to the boiling point.

This heat being kept up for a few minutes, the steam generated in the canister expels all the atmospheric air, and comes whistling with great force through the minute orifice. The canister is now slipped on one side, and the needle-hole instantly loaded with a drop of solder; and the steam being quickly condensed leaves a perfect vacuum in the tin.

Many of the products of fermentation, which is itself a result of gorm growth, have a powerful effect in preventing other substances from undergoing decomposition; the most remarkable of these are acetic acid or vinegar and alcohol. The formation of sugar, another product of fermentation, is a powerful means of preserving fruits, in which it is formed spontaneously, or to which it is afterwards added. The addition of sugar is practised in forming syrups, jellies, and preserves.

Those parts of plants which contain much carbon last the longest. In trees cut down and exposed to air and moisture, the bark, which contains most carbon, endures after the rest has perished. The seed also contains much carbon, and when seeds are sent from India to England they are always wrapped in recently prepared charcoal. When stakes or piles of wood are to be driven into the beds of rivers or marshes, they are previously charred; and to preserve water sent to sea the inner side of the cask is also charred.

There are many substances which when added to animal matter prevent for a longer or shorter time their decomposition, such as saltpetre (nitrate of potash), and common salt (chloride of sodium), which last is supposed to act by abstracting the elements of water; certain it is that meat is rendered by salting much drier, harder, less easily digested, and consequently less nourishing. Many aromatic substances have a similar power of preventing putrefaction for a time. These were extensively employed in embalming in ancient as well as modern times, as the Egyptian mummies prove. Oils and resinous substances long resist putrefaction, and preserve other substances from it; bitumen, naphtha, and empyreumatic oils are examples of this. Russian leather, which is dressed with the empyreumatic oil of the birch, not only does not become mouldy, but also preserves the books which are bound with it. The process of decomposition in this latter case is due to the agency of fungi, such as those which cause mouldiness, and the more formidable destroyers which occasion the dry-rot. The fungi are prevented from developing themselves by the presence of the aromatic oil. See DRY-ROT; TIMBER, PRESERVATION OF.

Fruits may be indefinitely preserved in glycerine. Tannin forms with gelatine one of the most enduring organic compounds. Bodies have been found perfectly preserved in peat bogs, that must have undergone the tanning process hundreds of years before. Many of the antiseptics act as positive poisons to the infusoria. Quinine, carbolic acid, creosote, chloroform, and the volatile oils act in this way. In surgery the antiseptic method of treating wounds by prevention of access of germs, and poisoning those which may slip in, has met with perfect success.

ANTISPASMODICS are those medicines which are used to prevent or remove spasm. The state called spasm occurs only in muscular structures, and consists in the irregular action of a portion of a muscle, of an entire muscle, or at times of a group of muscles, by which they are violently contracted and remain rigid or are subject to fits of alternate contraction and relaxation. It occurs in connection with hysteria, colic, whooping-cough, asthma, angina pectoris, neuralgia, &c. The remedies used against this painful affection are of two kinds, viz. those which act by stimulating the nervous energy of the system, and those which produce their effect by rendering it torpid and insensible. Of the former kind the most common are alcohol—generally used in the form of brandy—camphor, the oils of pepper-mint, anise, and lavender, the tinctures of valerian and

myrrh, nitrite of amyl, assafoetida, and musk; of the latter the principal are chloroform, ether, opium, belladonna, and bromide of potassium.

These kinds of antispasmodics differ in value, not only as relates to their mode of action, but to their safety. The stimulating antispasmodics are only admissible when a fit is threatened or may have begun; and as they greatly excite the vascular system, i.e. quicken the circulation, if upon their being given once they fail to remove the spasm they should not be repeated. This caution is more especially necessary in respect to brandy, which is too commonly resorted to on every threatening or attack of spasm such as colic. So many of these diseases being connected with or disposed to end in inflammation, the free use of brandy or other stimulants is decidedly injurious. The external employment, in the form of embrocations, of the stimulating antispasmodics is more allowable in colic or whooping-cough, but here they act on a different principle, viz. that of counter-irritation. This is in itself a most valuable means of curing spasmodic diseases. An irritating application to the spine is of much service in whooping-cough; tartrate of antimony ointment or plaster applied to the tender spot which often exists in hysteria and similar diseases will be productive of more good than all the antispasmodic medicines which can be tried. Severe hiccough, continuing for several days and unobviated by all internal remedies, has yielded to a blister applied along the side of the neck.

ANTISTHENES, the master of Diogenes, and commonly reputed the founder of the Cynic school. The time of his birth as well as that of his death is uncertain, but he was the contemporary of Socrates, Plato, Aristotle, and Xenophon. He was living in B.C. 371, for he caustically criticised the behaviour of the Thebans at Leuctra in that year; and Diodorus Siculus mentions him as still alive in 366. He was born at Athens, of which his father, named also Antisthenes, was a citizen. He first attended the school of the rhetorician Gorgias, but he afterwards became a follower of Socrates, and eventually established a school of his own in a place a short distance from Athens called Cynosarges, from which it is said the title of cynic is derived. The more probable derivation is, however, from Gr. *kunikos*, dog-like—because of their snarling talk, their dogged obstinacy, their use of tubs as it were for kennels, and the like. The invectives of Antisthenes, and especially of his follower Diogenes, appear to have been fiercely directed against the elegancies and ornamental superfluities of life; for to them pleasure was not only not necessary, but absolutely evil. Antisthenes seems to have been endowed with strong natural powers, but is said to have held all learning and mental cultivation in contempt, although his written works, as Diogenes Laertius tells us, extended to ten volumes, and were written in an elegant style. Even Plato was accused of borrowing from him. They have all perished. From the list of their titles given by the biographer they appear to have been mostly dialogues. Laertius has enumerated many of the sayings of Antisthenes.

Cicero ("De Naturâ Deorum," i. 13) has preserved a theological dogma of this philosopher, which has been often quoted to his honour—that the popular gods are many, but the God of nature is one. It has, however, been acutely remarked by Cudworth ("Intellectual System," i. 4, 22) that by the expression *populares deos* here we are to understand, not the gods of popular superstition generally, but merely the different names given to the same supreme ruler of the universe by different cities and nations. Cudworth is of opinion that the philosopher had no design to take away all the inferior gods of the pagans, which had he attempted he would have been accounted an atheist, but only to point out the great truth, which indeed was acknowledged by all superior minds among the ancients (with some exceptions), that there was one God who was supreme over

all the rest, and that he was the same whom the Greeks worshipped as Zeus, the Latins as Jupiter, the Egyptians as Hammon, the Babylonians as Bel, &c.

The moral maxims of Antisthenes sound in general very lofty. He regarded all actions as being either virtuous or vicious, and virtue as the only thing worthy of desire or esteem. Once gained this virtue would remain personally with the sage (who must isolate himself from the world), and preserve him evermore from error. Before giving him credit, however, as the teacher of a pure and elevated system of ethics, on the strength of these imposing generalities, it would be necessary to know exactly what he meant by virtue. The fullest and perhaps the fairest picture we have of Antisthenes is given by Xenophon, who has introduced this philosopher as one of the speakers in his "Symposium," or Banquet, and put into his mouth among other things a very striking discourse on the wealth of poverty. Altogether he is here represented in a very engaging light.

Antisthenes is said to have had few pupils, and to have treated them with great harshness. He has the credit of having set the example to his followers of wearing the beard long and carrying the staff and satchel, or wallet, which afterwards became the distinguishing badges of the Cynics.

Two short orations, entitled "Ajax" and "Ulysses," attributed to this philosopher, are printed in the "Oratores Græci" of Henry Stephens, and of Reiske. They are two puerile rhetorical declamations, and written by Antisthenes, which we may reasonably doubt, do him no credit.

ANTISTROPHE. See SYMPOHE.

ANTI-TAURUS. See TAURUS.

ANTITHESIS, a word of Greek origin literally signifying "opposition." It is used in various senses by the Greek writers; sometimes it means merely "objections," or "opposite arguments;" sometimes it is used to denote the contrasting of one set of circumstances with another, as for instance when a person, attempting to place the conduct of an adversary in the worst light, first states what the accused *ought* to have done and then what he *has* done.

But the term antithesis is most commonly used to express contrast of ideas, and the term is equally applied whether the contrast is effected by single words or by single clauses. (Quintilian, "Inst. Orat.," lib. ix. cap. iii.) Thus Socrates reproved Antisthenes the Cynic by the antithesis, "I see your pride through the holes in your cloak." This taste for antithesis shows itself very strongly in the Greek language, both in poets and prose writers, and more especially in some of the orators and rhetoricians, but its too great use is generally and justly condemned by the Greek writers on style. When antithesis is used sparingly and judiciously it sometimes gives force to expression, and helps to fix distinctions in the memory; but its indiscriminate use tends to draw the mind from a true perception of the subject, and to fix it on the play of words more than on the real meaning.

ANTITRINITARIAN, the name given to those who reject the doctrine of the Trinity on philosophical grounds. Where the doctrine is denied or disputed for theological reasons other terms, such as **ARIAN**, **SOCINIAN**, or **UNITARIAN**, are used. The Mohammedans are determined antitrinitarians, following in this respect the example and teaching of their founder, who fiercely opposed the orthodox Christian teaching on this subject. See **ARIUS**, **UNITARIAN**.

ANTIUM, now Porto d'Anzo, on the coast of Latium, in the Campagna of Rome, was once a city of the Volsci, and noted in Roman history as the place of refuge of Coriolanus. Antium, after having been often the enemy and at times the ally of Rome, was finally subjected by the Romans B.C. 337, and became a Roman colony. The people of Antium were given to piracy, but the Romans took their ships from them. Antium was a favourite place of retreat for the wealthy Romans in Cicero's time,

and was the birthplace of Caligula. Nero, who was also born at Antium, excavated a port, and adorned the place with fine buildings. The numerous ruins, which extend for 3 miles along the coast at Antium, show the extent of the old Roman city. Among them were found the famous Apollo Belvedere, and the Borghese, or Fighting, Gladiator. Pope Innocent XII. built the present small harbour. Porto d'Anzo now consists of a castle and a lighthouse which is on the new haven, and a few houses and huts.

ANT-LION (*Myrmelon formicarius*), an insect, one of the *NEUROPTERA*, is noted for the habits of its larva. The grub has six feet, large upper jaws, a flat head, and oval abdomen. It digs a tunnel-shaped hole in the sand, and lies hid at the bottom. When an ant or any small insect passes near the edge, the sand gives way and precipitates the unfortunate insect into the formidable jaws of the ant-lion, who often accelerates his victim's descent by throwing up with its mandibles a shower of sand.

The perfect insect, which is abundant in the south of Europe, measures about an inch in length, having large transparent wings, very like those of the dragon fly.

ANTONELLI, GIACOMO, Cardinal, was born 2nd April, 1806, at Sommo, on the Neapolitan frontier. His father was a head-smith and woodcutter, but of ancient family; and on the destruction of Sommo (a notorious den of thieves) by the Papal gendarmes, young Antonelli was sent to Rome and placed in the grand seminary. Here he so distinguished himself as to attract the notice of Pope Gregory XVI., who used him to several distinguished offices in the pontifical state. In 1847 Antonelli, then Papal finance minister, obtained the dignity of cardinal, and his extraordinary influence over Pius IX. speedily rose to a real supremacy. Anxious to swim with the stream of political agitation which in 1848 swept over Italy as well as all other parts of Europe, he was president of a liberal ministry of nine members, only three of whom were priests. A liberal constitution was proclaimed, and troops sent to support the Romanese; but on their defeat it was hastily explained that they had not been sent to oppose the Austrians, a desertion of the national cause, which greatly roused popular indignation, and necessitated the cardinal's retirement. He still, however, remained secret counsellor to Pius IX., by whom he was in 1859 made secretary of state, and later president of the council of ministers, prefect of the sacred apostolic palaces, &c. Antonelli became, in fact, sole chief of the pontifical constitution, the pope restricting himself more and more to his spiritual functions. In this character the greater part of the last twenty years of the cardinal's life was spent in vain resistance and protests against the steadily advancing triumph of the unity of Italy. The church benefited frequently by his energy, decision, and shrewdness; but from the time of the canonical council of 1870 his influence over the pope steadily declined, as the policy of the latter in the German church conflict, and the schism which broke out through the Old Catholic movement, became more closely identified with that of the Jesuits. Antonelli died 6th November, 1876.

ANTONELLO DA MESSINA, a celebrated Italian painter, distinguished as the first Italian who painted in oils, as it is termed. He was born at Messina about the year 1414, and was inducted in painting by his father, Salvatore d'Antonia. About the year 1442 he had occasion to visit Naples, where he saw in the possession of the king, Alfonso I., a picture executed in a manner and with materials quite new to him. This was a picture of the Annunciation by Giovanni da Bruggia (John of Bruges), as Vasari names John Van Eyck. Antonello having learned the name and place of residence of the painter, immediately set out for Flanders, where he remained with Van Eyck until his death in 1445. On his return to Italy Antonello remained at Venice with little interruption, in the enjoy-

ment of the reputation of one of the most distinguished painters of his age, till his death, about 1498.

Antonello appears to have made no secret of his new method of painting after his establishment at Venice. The method of painting simply in oil was very old, and that of Van Eyck was not merely painting in oil; it was, according to Vasari, painting in varnish. Vasari says that Van Eyck, by boiling linseed, poppy, and nut oils, with other mixtures, obtained that varnish which he in common with every other painter in the world had long desired.

ANTONINE COLUMN, a lofty pillar which stands in the middle of the Piazza Colonna (named after it) in Rome. It was raised by the senate in honour of the Emperor Marcus Aurelius Antoninus, and in memory of his victory over the Marcomanni and other German tribes. The shaft of the pillar is 13 feet 1 inch in diameter at the bottom and a foot less at the top; its height, including the pedestal and capital, is 136 feet, of which 13 are underground; and the statue on the top and its pedestal are 27½ feet more, making the whole height 163½ feet. The pedestal of the Antonine Column is disproportionate to the shaft. The capital is Doric. The shaft is made of twenty-eight blocks of white marble. A spiral staircase of 100 steps is cut through the interior of the marble, and leads to the gallery on the top, which is surrounded by a balustrade. The exterior of the shaft is covered with bas-reliefs placed in a spiral line around, which represent the victories of Marcus Aurelius over the Marcomanni and other hostile nations. The style and execution of these sculptures are inferior to those of the Trajan Pillar, which the artists evidently purposed to imitate. In 1589 Sixtus V. caused it to be restored and crowned with a statue of St. Paul. At that time it was ascribed to Antoninus Pius.

ANTONINUS, ITINERARY OF, one of the most valuable works, in a geographical point of view, which has descended to us from the ancients. It is merely what its name imports, an itinerary; but it extends over the whole Roman empire in its widest sense, embracing all the main roads in Italy and the provinces, in each of which the different stations are named with the intervening distances. There is also attached to the above a brief maritime itinerary of the distances from port to port. This work, with the *Pentingerian Table* and the *Jerusalem Itinerary*, is of great use in constructing the maps of the Roman and Grecian world. Though called by the name of Antoninus, the date of this work and the name of the author are uncertain. On a consideration of all the arguments there seems reason for thinking that some share in the authorship may be ascribed to the three distinguished names, Julius Cæsar, M. Antoninus, and Augustus.

The roads of Britain could not have been all added to the Itinerary until the time of Septimius Severus, whose *callum*, or great wall of protection against the Picts (erected A.D. 209), is more than once mentioned. The name *Dioeletianopolis* (p. 380) carries us to a period between A.D. 285 and 305. Whatever may be the date of the Itinerary, it received additions to a late period. The best editions are Wesseling's (1735), and Parthey's (Berlin, 1818).

ANTONINUS, MARCUS AURELIUS. See *AURELIUS, MARCUS*.

ANTONINUS PIUS, or, with his full name, according to Capitolinus, Titus Aurelius Fulvus Boionius Arminius Antoninus Pius, was the son of Aurelius Fulvus and Annia Fadilla. He was born 19th September, A.D. 86, in the reign of Domitian, at Lanuvium, now Lavinia, a town of Latium, a few miles south of the Alban Lake. His ancestors on his father's side were of Nemausus (Nîmes), in Gaul.

Antoninus inherited great wealth, and was speedily raised to the successive dignities of *quæstor*, *prætor*, and

consul. But his taste was for a country life. When Hadrian intrusted the administration of Italy to four men of consular rank he gave to Antoninus the government of that part in which his possessions lay. On his return to Rome from acting as proconsul of Asia, he was often consulted by Hadrian on public matters; and he was adopted as the emperor's successor, on condition of himself adopting Marcus Aurelius, the son of his wife's brother, and Lucius Verus, the orphan son of a certain Commodus, adopted by Hadrian. He then became associated with the emperor in the government, and used as his name at this time T. Ælius Hadrianus Antoninus Cæsar. On Hadrian's death, A.D. 138, he became emperor with the title of Antoninus Augustus, to which the name of Pius was added by the senate on account of his loving, dutiful conduct (*pietatis*) at Hadrian's death. He seems never to have left Italy after his elevation, but his officers maintained the security of the provinces and protected the frontiers from aggression. In Britain, Lollius Urbicus confirmed the former conquests; the Moors of Africa were compelled to sue for peace; and the attempts at rebellion in Germany, Greece, Judæa, and Egypt were checked by the vigour of his governors. The emperor died at Lorium in the seventy-fifth year of his age (seventieth, according to Capitolinus), A.D. 161, and was succeeded by Marcus Aurelius Antoninus, commonly called the Philosopher. Antoninus was buried in the tomb of Hadrian, one of the architectural monuments with which he adorned Rome, better known under its modern name of the Castle St. Angelo.

Antoninus married Annia Faustina, the daughter of Annus Verus, by whom he had four children, one of whom, Faustina, became the wife of M. Aurelius. The conduct of Antoninus' wife gave occasion to scandal, but on her death, in the third year of his reign, the senate paid her the usual compliment of divine honours. The façade of a temple erected to Faustina, as divine, with an added inscription joining Antoninus with her (added at his death), is still one of the finest objects in the Forum at Rome. The policy of Antoninus was beneficent and just, and the Roman world perhaps never had a more virtuous master. He continued the governors of provinces for many years in office when their conduct was satisfactory; and the provinces themselves enjoyed under his reign freedom from all exorbitant taxation. The old Roman aggressive policy was everywhere abandoned. He surrounded himself with a council of chosen friends, without whose advice he took no public measure of any kind. In his elevated station the emperor maintained the simple character of his early life, mingling in the society of his friends like one of the same rank, and using his unlimited power more like a private citizen intrusted with it by his fellow-countrymen than as the undisputed master of the empire. The practice of giving pensions or allowances had grown up under preceding emperors, and had become a part of the imperial system of patronage. Antoninus continued it, and gave, as Capitolinus informs us, salaries and honorary distinctions to the professors of rhetoric and philosophy in all the provinces. Apollonius the Stoic was specially invited from Chalcis to superintend the education of M. Aurelius. The people and the soldiery participated in the bounty which the policy or generosity of the emperor distributed. He relieved distress in time of scarcity, and for their amusement filled the amphitheatre with animals from all countries.

Under the reign of Antoninus the lawyers Umidius Verus, Salvius Valens, Volusius Maecianus, Ulpian Marcellus, and Diabolus were employed to amend the laws. One of the emperor's regulations of sanitary police forbade the burying of dead bodies in cities. He embellished the imperial city with various edifices, and extended his liberality to remote cities of the empire. Antoninus was tall and of a handsome person, as his biographer tells us and

his medals still show. His habits were abstemious and regular. He was honoured with the name of Divus (deified) at his death.

ANTONINUS, WALL OF. This was an entrenchment raised by the Romans across the north of Britain under the direction of Lollius Urbicus, legate of Antoninus Pius, about A.D. 140, and is supposed to have connected a line of forts erected by Agricola, A.D. 80. Julius Capitolinus, the only ancient writer who mentions this rampart, calls it a turf wall (*murus cespitiatus*). The work was composed of a ditch, a rampart with its parapet, made of materials taken from the ditch, and a military way running along the whole line of the entrenchment at the distance of a few yards on the south side. It extended from Dungleigh Castle on the Clyde to the heights above Caer Ridden Kirk, a little beyond the river Avon on the Frith of Forth, or probably to Blackness Castle, 2 miles further on, though it cannot now be traced so far. In its course are nineteen forts, the eighteen distances between which amount to 63,980 yards, or 36 English miles, and the mean distance from station to station is 3554 yards, or rather more than two English miles. In the position of the forts the Romans chose a high and commanding situation from whence the country could be overlooked to a considerable distance, contriving, as far as circumstances would permit, that a river, morass, or some difficult ground should form an obstruction to any approach from the front. Forts were also placed upon the passages of those rivers which crossed the general chain of communication. A very considerable portion of the entrenchment may still be traced. The modern name is Graham's Dyke. The most perfect remains of the wall of Antoninus are to be seen in Callander Park, near Falkirk; on the moor of Bonnieside, near Castlecary; and not far from Polmont Station, on the Edinburgh and Glasgow Railway.

ANTONIUS, MARCUS, the Triumvir, more generally known as Mark Antony, was born B.C. 83. He was the eldest son of M. Antonius Creticus (whose father was Antonius the orator, extolled by Cicero), and Julia, sister of Lucius Julius Cæsar, consul in B.C. 61. He was brought up by his stepfather, Lantulus, who had married Julia after Antonius' death. Lantulus was put to death by Cicero as a conspirator with Catiline; wherefore Mark Antony was ever a bitter enemy of Cicero. He was very dissipated, and at last fell so deeply in debt that he was obliged to leave Rome, B.C. 58. He went first to Greece, where he studied for a time, and afterwards to Syria, where the proconsul Gaius made him commander of the cavalry. In the war undertaken by the Romans (B.C. 55) to restore Ptolemy Auletes to the throne of Egypt, Mark Antony distinguished himself by the display of considerable military ability; and by his personal courage and energy made himself very popular with the soldiers. He next served under Cæsar in Gaul, and was rewarded with the questorship. He again served (as quaestor) under Cæsar, and in the year B.C. 50 returned to Rome to watch over Cæsar's interests. He was elected into the college of augurs, and was appointed tribune for the year B.C. 49; but on the senate depriving Cæsar of his command he hurriedly put his veto as tribune on their decree, and fled from Rome in disguise to the camp of Cæsar, who at once set out on his famous march—crossed the Rubicon, and quickly drove his enemies out of Italy.

When Cæsar started on the first expedition into Spain, B.C. 49, he left the military command of Italy to Antony, who successfully defended Brundisium and its port against an attack by Pompey's fleet; and at the critical battle of Pharsalia he commanded the left wing of Cæsar's army (B.C. 48). The following year Cæsar, being appointed dictator, selected Antony as master of the horse, an appointment which gave him the chief authority in the

absence of the dictator. He displayed firmness (as against Dolabella, &c.), but at the same time became notorious for his open debauchery. He divorced his wife, and appeared in public with a Greek actress named Cytheris, sitting in a car drawn by lions. In the year B.C. 44, having dismissed Cytheris, he married Fulvia, the widow of Clodius, and the next year became the colleague of Cæsar in the consulship (B.C. 44). It was at this time (at the Lupercalia festival) that Antony offered Cæsar the crown in the name of the people, and Cæsar refused it. After the assassination of Cæsar he showed himself worthy of his grandfather as an orator, for he so inflamed the people against the conspirators by his impassioned harangue that they were compelled to flee from Rome. He appears to have aspired to occupy the post left vacant by Cæsar, but he found a powerful opponent in young Octavianus (afterwards Augustus), the great-nephew and adopted son of the late dictator, who joined the senatorial party against him. Before the end of the year hostilities commenced, and in Gaul, where Decimus Brutus was his opponent, Antony was twice defeated, and was compelled to cross the Alps. He proceeded to the camp of Lepidus, who commanded the army of Gaul, and who joined him with his forces, Antony taking supreme command. His strength was further increased by Octavianus becoming reconciled to him, and by the adhesion of the generals Ventidius, Plancus, and Pollio, so that he was soon able to return to Italy and march towards Rome against the republican party at the head of seventeen legions and 10,000 cavalry.

In the autumn of B.C. 43 a conference was held between the leaders, and it was then decided that the Roman government of the state should be shared between them; and the First Triumvirate, of Antony, Lepidus, and Octavianus, was established. To make their power secure, they at once proscribed all whom they considered their enemies. Among the first to fall was the orator Cicero, and the massacre was continued until no less than 300 senators and 2000 knights were executed. Antony and Octavianus now marched against Brutus and Cassius, the chiefs of the republican party, encountered and defeated them at a battle fought in the neighbourhood of Philippi, in Macedonia (B.C. 42). Both Brutus and Cassius perished. Antony then crossed into Asia, where he summoned the Egyptian queen Cleopatra to meet him at Tarsus to answer some accusations brought against her of assisting Cassius in the late war. The queen, in answer to his command, appeared in her gorgeous barge upon the Cydnus, attired as the goddess Venus, and by her beauty and address so captivated him that he followed her to Alexandria, where he indulged in voluptuous revels. He was roused by a Parthian war on one side, and a war in Italy on the other. The conflict with the Parthians was postponed in order to oppose Octavianus in Italy, who was engaged in hostilities with Lucius Antonius, the brother of Mark Antony, but peace was made before he arrived, and a reconciliation effected (B.C. 40). To further cement the friendship, Antony, whose wife Fulvia died most opportunely, married Octavia, the sister of Octavianus, and a fresh division of provinces was made. To Antony was awarded the eastern division, to Octavianus the western, while Lepidus received Africa as his portion. In B.C. 37 Antony invaded Parthia, but though he had made preparations on the largest scale, his operations were unsuccessful, and he was compelled to retreat after sustaining severe losses.

In the year B.C. 35, when Octavia was bringing him a fresh supply of money and a large number of recruits for his diminished army, he sent her orders to remain at Athens, while he added to the insult by resuming his former intercourse with Cleopatra, and assuming the state of an eastern monarch. Such conduct greatly excited the anger of the Roman people; and Octavianus, who had

already deprived Lepidus of his authority, seized the opportunity to turn his arms against Mark Antony. Two years were spent in preparations for the struggle, and in B.C. 31 the rival fleets and armies met at Actium. Cleopatra, who had entered the conflict with sixty ships, took flight in the midst of the battle, and being followed by her infatuated lover, his forces were completely defeated and destroyed. He retreated with Cleopatra to Egypt, where he endeavoured to forget the perils of his position by indulgence in revelry and excess till the appearance of Octavianus with a fleet and an army before the city of Alexandria roused him to activity, and at the head of his cavalry he gained a temporary victory over the land forces of Octavianus; but the subsequent desertion of his fleet and a large portion of his army left him only the hope of sustaining a siege. He was soon abandoned by most of his friends and followers, and finally discovered that even Cleopatra was conspiring against him. Maddened with anger, he went to her palace to take vengeance upon her, but on arriving there found she had escaped. Receiving shortly afterwards a false message of her death, he repaired to her mausoleum, resolved not to survive her, and falling on his sword inflicted a mortal wound. He was drawn up into the mausoleum by her attendants, and died in her arms. He was in the fifty-third year of his age when he perished (B.C. 30). Cleopatra, after vainly trying to fascinate the colder Octavianus in the manner which had been so successful with Antony and with the great Julius, saw that all was over, and poisoned herself with asps to avoid the shame of exposure in a Roman triumph.

ANTONY, MARK. See ANTONIUS, MARCUS.

ANTONY, ST., sometimes named **THE GREAT** or **St. ANTOXY OF THEBES**, was born at Kona, a village in Upper Egypt, in the year 251. His parents, who were both wealthy and pious, gave him a religious education, but prevented him learning any other language than his native Coptic. On entering upon his inheritance at the age of twenty, he sold all his possessions, and bestowed the price upon the poor; and having placed a sister who was committed to his charge in a house of virgins, he retired to the wilderness to lead an ascetic life. Here he practised various mortifications, with a view of obtaining spiritual perfection. When about thirty years of age he penetrated still further into the desert, and took up his abode in an old ruin, where he spent twenty years in the most profound seclusion. In 305 he was sought after by a number of anchorites who wished to live under his guidance, and in answer to their request he founded his first monastic institution at Fafoun, near Memphis. In 311, persecution having broken out at Alexandria, he visited that city in the hope of obtaining the crown of martyrdom, but failing in this he withdrew to a lonely hill near the shores of the Red Sea. Here he was discovered by his disciples, and accompanied them back to Fafoun. At a later period he again left them for a solitary life, but his fame as a saint and worker of miracles brought many to visit him, and he exercised a very extensive influence over the church in Egypt at that period. In 355, at the age of 104, he again visited Alexandria to dispute with the Arians, but feeling his end approaching he retired to the desert, where he died in the year 356.

He is generally regarded as the founder of monachism, but the monastic rules attributed to him are not believed to be genuine. His life, written by St. Athanasius, and a few letters and discourses, have come down to us, but their authenticity has been denied by some scholars, and others regard them as being largely interpolated. St. Antony is one of the most popular saints in the Roman Calendar. His festival is observed on the 17th January.

ANTRIM, a maritime county of Ireland in the province of Ulster, is bounded on the N. by the Atlantic Ocean,

E. by the North Channel, S.E. by Belfast Lough, S. by the county of Down, S.W. by Lough Neagh, and W. by the county of Londonderry. The county extends from N. to S. 56 miles, and from E. to W. 30 miles. The most northern point is Bengore Head, $55^{\circ} 16' N.$ lat., and the most eastern is Black Head, $5^{\circ} 42' W.$ lon. The total area of the county is 1164 square miles, or 760,000 acres, including 50,000 of water. The climate is very temperate.

The western extremity of the coast is at Port Rush, N. by W. of which lies the small group of islands called the Skerries, and a few miles further E. the Giant's Causeway, an immense pile of perpendicular basaltic columns. [See GIANT'S CAUSEWAY.] Other masses of columnar basalt appear on the north coast, at Bengore Head, at Fairhead, and elsewhere. The coast from Port Rush to Fairhead is nearly W. and E.; it then turns round, and runs nearly S.S.E., presenting a succession of precipitous cliffs, broken by a few bays and creeks; especially by the bay called Lough Lorne, till it reaches the entrance of Belfast Lough, when it turns inward and runs S.W. to Belfast. The island of Rathlin, of which the nearest point is about 8 miles from the north coast, contains 3398 acres and about 500 inhabitants, who are chiefly employed in fishing and farming. The highest summit, Kenamer, is 449 feet above the sea. The greater part of the surface is rocky, and affords some pasture; the valleys and more sheltered places are fertile, and yield good crops. The so-called island of Magee is in reality the peninsula which, extending about 8 miles northwards, and being rather more than a mile in width, forms the bay called Lough Lorne. It is bleak but fertile.

The eastern side of Antrim is mountainous; but the mountains form irregular groups rather than a continuous chain, and are intermixed with bogs, which also prevail in the western and flatter part of the country. The highest are—Trostan, 1800 feet above the sea; Knocklayd, 1680 feet; Agnew, 1560 feet; and Slemish, 1110 feet.

The most important river is the Bann, which separates Antrim from Londonderry on the west. [See BANN.] The main, after a course southwards of about 30 miles, falls into Lough Neagh. The Bush, after a course of about 20 miles, first westward and then northward, falls into the sea at Ballintrae. The Lagan rises in the county of Down, and after a course of about 40 miles, falls into Belfast Lough, having during a part of its course separated the county of Antrim from that of Down.

The subsoil is basalt or trap, slate-clay, and limestone. A coal-mine was opened at Ballycastle, but the coal was found to be inferior, the seams thin, and the works were relinquished. Fossil-wood, or wood-coal, occurs at Killymorris, near Ballintoy, on the same coast. Gypsum, marble, and beautiful crystal pebbles are found, and there are salt mines at Dunerue, Carrickfergus, the produce of which is of superior quality. Iron ore is also obtained. There is a large extent of fertile land in the county. The following were the chief crops in 1885:—Wheat, 4500 acres; oats, 77,000 acres; potatoes, 46,000 acres; flax, 17,700 acres; and meadow and clover, 87,000 acres. Of late years considerable increase has taken place in the rearing of domestic animals, especially goats and sheep. There are salmon and other fisheries on the coast—chiefly at Ballycastle and Carrickfergus. The greatest part of the manufacturing population is employed in the spinning of linen and cotton yarn, and in linen and cotton weaving. The chief seat of the manufacture is BELFAST; and both in that town and the country immediately around, the people are more prosperous and industrious than anywhere else in Ireland. There are also extensive paper-mills in the county. Cairns, cromlechs, and other interesting relics of antiquity are found.

Antrim is divided into fourteen baronies, and contains seventy-five parishes. Since the Redistribution Bill of 1885 it has returned eight members to the House of Commons, four for the county and four for Belfast. The population of the county in 1881 was 423,171—an increase of 19,156 from 1871. There were 108,606 Roman Catholics, 98,203 Protestant Episcopalians, 190,746 Presbyterians, and 11,794 Methodists. The large number of Presbyterians is accounted for by the settlement of numerous colonists from Scotland and England. Antrim stands third among the Irish counties in population, but in extent it is only the ninth.

The principal towns are Belfast, Antrim, Ballymena, Ballymoney, Carrickfergus, Larne, and Lisburn.

ANTRIM, a market town in the above county, situated on the north bank of the Six-Mile Water, near the N.E. corner of Lough Neagh, is about 17 miles N.W. from Belfast, and is a station on the Belfast and Northern Counties Railway. It consists principally of two good streets, and has some trade in bleaching, paper-making, stocking-making, malting, and the weaving of linen and calico. The Protestant church is a modern Gothic structure; there are also a Roman Catholic church, and meeting-houses for Presbyterians and Methodists. The population, including Massereene, in 1881 was 2900. Near the town is Antrim Castle, the seat of Viscount Massereene and Ferrard, and a mile to the N.E. is one of the most perfect of the ancient round towers of Ireland, 95 feet high.

Antrim gives the title of earl to the MacDonnell family, and from 1666 until the time of the Union it sent two members to Parliament. In the neighbourhood a battle was fought between the English and native Irish, in the reign of Edward III.; and in 1798 a large body of insurgents was defeated, after an obstinate encounter, resulting in the death of Earl O'Neill.

ANTWERP, one of the nine provinces of the kingdom of Belgium, is bounded N. by the Dutch province of North Brabant, E. by Limbourg, S. by South Brabant, and W. by East Flanders and Zealand. Its length from N. to S. is about 35 miles, and from E. to W. 40 miles. The area of the province is 1093 square miles; the population in 1883 was 602,698.

The province of Antwerp is flat, fertile, and highly cultivated. The soil, which is generally alluvial, yields in perfection all the crops common to England and the north of France. Cattle, sheep, and horses are reared, and among the manufactures are fine cotton, silk, and tobacco. The district called the "polders" extends along the Scheldt, from the neighbourhood of Antwerp to Zantvliet; it was originally a marsh which was flooded by every tide, its surface being lower than the level of the river at high water. Dykes having been built to keep off the tide, the surface of the marsh was drained by means of water-wheels turned by windmills, and what was before an unhealthy swamp was changed into the richest pasture and arable land. There are some barren heaths in the north and north-east of the province. The province is well wooded, especially towards the south. The houses are strong, built of brick or stone, and generally thatched with straw; the roads are paved with broken stones. The principal rivers are the Scheldt and its feeders—the Rupel, the Greater Nethe, the Lesser Nethe, and the Dyle. By means of these rivers, all of which are navigable, and by its numerous canals and railways, the province has excellent means of communication, not only with every part of Belgium, but with France, Prussia, and the interior of Germany. The principal towns of Antwerp are, Antwerp, Mechlin, Boom, Ghel, Lierre, and Turnhout.

By the marriage of Mary of Burgundy to the Archduke Maximilian, the province of Antwerp fell to the house of Austria, in whose hands it remained till the French

revolution, when it was formed into the department of Deux-Nèthes; in 1814 it became part of the kingdom of the Netherlands, and in 1830 a province of the kingdom of Belgium.

ANTWERP, the principal seaport of Belgium, is called by the natives *Antwerpen*, by the Spaniards *Amberes*, and by the French *Anvers*; it is situated on the right bank of the Scheldt, where the river makes a considerable bend. The name is derived from an *'t veer'*, on the wharf. This port, with its spacious dock, basin, and quays, and its safe anchorage, is one of the best in Europe, although the navigation from the sea is somewhat tedious. It has sufficient depth for the largest vessels, and every convenience for shipbuilding. It is 27½ miles by railway N. from Brussels, and 45 miles from the mouth of the Scheldt. The breadth of the river opposite the city is about 440 yards, and the rise of the tide is 12 feet. For 2 miles in front of Antwerp the depth at low water is from 32 to 42 feet.

Numerous handsome buildings have been erected in Antwerp in recent years, and some of the streets present an exceedingly fine appearance. The custom of planting trees in the chief thoroughfares adds much to its beauty, and have greatly improved its appearance. The Gothic cathedral is one of the largest buildings in Belgium; it is 500 feet long, 250 wide, and has a spire 400 feet high. It was commenced in the early part of the fifteenth century, though not finished until 1518, and is remarkable as being the only European church containing six aisles. The interior is adorned with "The Descent from the Cross," and several other of the finest pictures of Rubens, who was educated, resided, and died at Antwerp, and to whom a statue has been erected in the Place Verte. The Hôtel de Ville, or Town Hall, is a large and handsome building, with a front of about 260 feet, and the Bourse or Exchange—originally erected in 1531, but burned down in 1858 and afterwards rebuilt—is also a fine structure. The Church of St. Jacques contains the tomb of Rubens, and some splendid decorations and monuments; St. Michael's Church; the Gostelings, which was originally the factory of the Hanseatic League; the palace built by Napoleon in the Place de Meir; St. Paul's and St. Andrew's churches; and the churches of the Augustines, are also fine edifices, and are decorated with the masterpieces of Flemish art. Antwerp also possesses academies of science and fine arts, picture and sculpture galleries, a school of navigation, a medical college, a public library (containing 30,000 volumes), botanical and zoological gardens, hospitals, and various learned societies. A colossal bronze equestrian statue of King Leopold was erected in 1868.

Antwerp was formerly the seat of the silk manufactures of Belgium, and was especially famous for its black satins and velvets. It has lost its renown for these, but is still noted for its sewing silk, black silk stuffs, and printer's ink. It also has large manufactures of cotton, linen, lace, carpets, hats, cutlery, and surgical instruments. It contains several dockyards, sugar refineries, distilleries, breweries, and a bleaching establishment.

Antwerp, which appears to have been founded in the fifth century by a people of Saxon race, was in the sixteenth century a small republic. The industry of its inhabitants, joined to the security and freedom of its laws, as well as its favourable situation, raised it to the rank of the first commercial city of Europe during the reign of Charles V. Previous to its capture by the Spaniards under the Duke of Parma, in 1585, Antwerp was one of the best cities in Europe; but it suffered much by that event. By the peace of Westphalia in 1648 the navigation of the Scheldt was closed, and this, added to other calamities, destroyed the prosperity of the city. The navigation of the Scheldt was opened at the time of

the French occupation of Antwerp in 1792. In 1798 the French evacuated the town, but took it again in 1794, and held it till 1814, when it was surrendered to the allies after the treaty of Paris by Carnot, who had defended it up to this time. After the revolution of 1830 the King of Holland refused to evacuate the citadel of Antwerp, in accordance with the terms agreed on for the separation of Holland and Belgium. In consequence the French entered Belgium with a large army, and commenced the bombardment of the citadel 29th November, 1832. Though bravely defended by General Chassé with 4500 men, it surrendered on 24th December. The fortifications, erected in place of the ancient defences which were demolished in 1860, are built in such a manner that Antwerp is one of the strongest cities in Europe, and it is estimated that it would require an army of 170,000 men to besiege it effectually. The old fortifications have been converted into handsome, broad boulevards or avenues.

In 1803 Napoleon undertook the construction of immense docks for ships of war; and it now possesses convenient docks and warehouses for the use of the steamers and other vessels connected with the trade of the port. Formerly the Scheldt dues were exceedingly high, but they were entirely abolished in 1863; the precedent set in the case of the Sound dues being followed, i.e. the different powers agreed to pay the Belgian government certain sums proportioned to the extent of their trade with the city. The British contribution to the purchase, which was much the largest, was 8,782,320 francs. As a natural consequence this effectual reduction of the charges on vessels entering her port powerfully contributed to the advancement of the trade of Antwerp. The number of vessels which now enter annually is about 7000, of 3,750,000 tons burden, and of these about three-fifths are British. Ships of the largest size come up to the town, and goods destined for the interior are forwarded with the greatest facility by means of canals and railways. In fact, the principal part of the commerce of Belgium, carried on by sea, centres in Antwerp, and it is now the third port in Europe—ranking next after Liverpool and London in the extent of its commerce. The docks and maritime establishments generally were inadequate to meet the increasing demands of trade. Large extensions and improvements in the town having also become necessary, a municipal loan was contracted in 1874, and the works afterwards carried out included numerous buildings to accommodate the increasing number of inhabitants, water, drainage, and paving works, a public abattoir, extensive quays, docks, &c.

The imports consist principally of coffee, sugar (mostly raw), and other colonial products, corn, coal, machinery, iron, raw cotton, hemp, hides, leather, timber, petroleum, guano, tobacco, wool, dye stuffs, salt, wines, &c. The chief exports are flax, cotton and linen manufactures, silks, butter, cheese, eggs, poultry, refined sugar, glass, zinc, oak-bark, grain and seeds, fruit, lace, carpets, &c. There is regular steam communication with London, Liverpool, Hull, and Harwich, and also with the other chief European ports and with America. The population had increased from 90,000 in 1848 to 180,447 in 1888.

Various persons of eminence have had their birth in this city, the chief among whom are the painters Vandyck, the two Teniers, Jordaens, and others; the geographer Ortelius; the engraver Edelinck; and in more recent times Ogier the dramatist, Conscience the novelist, and Van Meteren the historian.

ANWEILER, a town in the circle of the Rhine, in the kingdom of Bavaria. It is built on the Queich, and was formerly a free imperial city. It has 8000 inhabitants, who are chiefly engaged in the cultivation of the vine, and in the manufacture of paper and leather. The ruins of the castle of Triefels, where Richard Cœur-de-Lion was kept a prisoner in 1193, may be seen in the vicinity.

ANUBIS, an Egyptian deity, always represented with a dog's head. He was the attendant divinity of Isis, and the conductor and guardian of the departed. In fact, he so resembled Hermes that the Greeks frequently called him *Hermanubis*. Anubis was worshipped at Rome under the Empire.

ANUBIS (*Cynocephalus anubis*), is a BANOON found in the lilly districts of Guinea. The skull is very flat, with a projecting muzzle. The hard bare patches on the hinder parts are blood-red. The principal food of the anubis seems to be the *Welwitschia*, a curious woody plant, found by Dr. Welwitsch in some parts of Western Africa.

ANVILLE, JEAN BAPTIST D', was born at Paris in 1697. From his boyhood he showed a strong bias for geographical studies. At the age of twenty-two he was appointed one of the king's geographers. He was employed by the Jesuits to make an atlas of China for the edition of Duhalde's history of that empire. This atlas was published at the Hague in 1737. But the work that established his reputation was his map of Italy, published in 1743. In it he corrected many errors of his predecessors, and in 1744 published his "Geographical Analysis of Italy," in illustration of it. A catalogue of D'Anville's maps and works is given by Barbié du Bocage (Paris, 1802). He published 104 maps on ancient and 106 on modern geography, and wrote about forty works, including several memoirs, which are inserted in the "Recueil de l'Académie des Inscription et Belles Lettres." He died in 1782.

It is remarked by the biographer of D'Anville ("Biog. Universelle") that his style is not good, and that owing to this and other causes there is often a want of method and clearness in his dissertations. We believe that D'Anville was occasionally more indebted to previous geographers than is generally supposed; in saying this we do not mean to detract from his real merit, which will stand the test of the most rigorous examination.

ANKUR. See TERRACINA.

ANZIN', a village in the neighbourhood of Valenciennes, in the department of Nord, is the seat of the most extensive collieries in France. The pits altogether amount to forty, some of which are more than 1400 feet deep. The coal burns fiercely, and is in demand for purposes which require an intense flame; to this circumstance perhaps may be ascribed the establishment of glass-works, iron foundries, and manufactories at Anzin. The number of persons employed in the mines amounts to 6000.

AORIST, a form of the Greek verb which expresses a past action undefined as to time. It is of especial use in narrative, to which it imparts great animation.

AORTA, a Greek word (*aortē*). The aorta is the great vessel from which all the arteries of the body which carry red blood derive their origin. It arises from the upper and back part of the left ventricle of the heart. Its origin is directly opposite the lower margin of the cartilage of the third rib on the right side of the chest. From this point it ascends behind the pulmonary artery, still inclining a little to the right side of the chest. It continues to ascend as far as the top of the second vertebra of the back. All this part of the vessel is called the *aorta ascendens*. When it reaches as high as the lower margin of the first rib it bends obliquely backwards towards the body of the third vertebra of the back. This part of the vessel is called the curvature, or the transverse arch of the aorta. From the third vertebra of the back, where its arch terminates, it proceeds in a straight course downwards through the chest, immediately in front of the spinal column, and towards the left side of it. Through an opening formed for it in the DIAPHRAGM it passes from the chest into the abdomen.

AOSTA, a district of Northern Italy, in the province of Turin, is principally formed by the Val d'Aosta, and is watered by the Dora Baltea, an affluent of the Po. It has an area of 1233 square miles, and is surrounded by some of the loftiest of the Alpine mountains. The fort of Bard, which commands one of the rocky passes, checked the advance of Bonaparte's army for several days in May, 1800. Forests of firs and larches clothe the mountain sides, while in the valleys the vine, olive, almond, fig, and mulberry trees grow luxuriantly. Large quantities of grain are cultivated, and cattle are reared. Aosta is rich in minerals; iron, copper, lead, silver, manganese, cobalt, crystal, and rock-salt are found; particles of gold are met with in some of the streams, especially in that which flows through the valley of Challant. Mineral springs also abound, and there are quarries of marble. The inhabitants of the district number about 83,000, many of the poorest of whom emigrate for the winter, and earn their living by various callings in the neighbouring countries. Some have mules, and act as carriers or guides across the Alps. The disease known as cretinism is very prevalent.

AOSTA, the chief town of the above district, is built in an opening where several valleys meet, at the junction of the Dora Baltea and the Buthier, 42 miles N.W. of Turin, and 65 S.E. of Geneva, near the base of Mount St. Bernard. The scenery in the neighbourhood is remarkable for its beauty. The town is the seat of a bishop, and has a tribunal of justice, a college, two hospitals, three churches, a fine town-hall, and a cathedral. Its chief architectural attractions, however, are the ancient Roman structures which it contains, among which are a triumphal arch, a round tower, and an amphitheatre. Aosta is a corruption of Augusta. Its Roman name was *Augusta Prætoria*. The valley was originally inhabited by the Salassi, a Celtic race, who commanded the passage of the Great and Little St. Bernard, the two most important routes from Italy to Gaul. They frequently harassed the Romans, and were ultimately extirpated by Augustus—who is said to have sold 36,000 of them as slaves—and who founded Aosta to protect the high roads, and named it after himself. The town is celebrated as having been the birthplace of Anselm, archbishop of Canterbury. St. Bernard, who founded the famous hospice, was an archdeacon of Aosta. The population, who number 8000, trade extensively in cheese, wine, hemp, and leather.

APANAGE (from the Low Latin *apanare*, through the Old French *apaner*, to support, literally to supply with bread, *pain*), the provision of lands or feudal superiorities assigned by the kings of France for the maintenance of their younger sons.

Under the first two races of French kings the children of the deceased king usually made partition of the kingdom among them; but the inconvenience of such a practice occasioned a different arrangement to be adopted under the dynasty of the Capets, and the crown descended entire to the eldest son, with no other dismemberment than the severance of certain portions of the domains for the maintenance of the younger branches of the family. Towards the close of the thirteenth century the rights of the apanagist were still further circumscribed; and at length it became an established rule that upon the failure of lineal heirs male the apanage should revert to the crown.

By a law of 22nd November, 1790, it was enacted that in future no apanage *real* should be granted by the crown, but that the younger branches of the royal family of France should be educated and provided for out of the civil list until they married or attained the age of twenty-five years; and that then a certain income, called *rentes apanagères*, was to be granted to them, the amount of which was to be ascertained by the legislature for the time being.

The name apanage is now also given to the allowance

assigned to the princes of a reigning house for their proper maintenance out of the public funds. Such apanages are introduced in those cases where a civil list is established, and the property originally intended for the support of the members of the reigning family has either been converted wholly or partly into public property, or is administered as public property. In states where there has been no such change the reigning prince may be properly enough left to provide for all the members of his family out of the means supplied him by the civil list. In modern times neither the honour of a nation nor the dignity of the members of a reigning family depends in any degree on the amount of the expenditure which such members make out of the public treasury, so there are no reasons whatever for making them any independent allowance, except reasons of general interest. Thus, in constitutional monarchies, when the princes of the royal family are called to any active participation in the offices of state, the allowance of a suitable income out of the public treasury serves to give them a more independent position with respect to the head of the state. Such an allowance may also serve, in the case of princes who stand in the line of succession, to give to those who may be the future heads of the state the respect due to their station, and to secure them a suitable and certain income, and thus to draw more closely the ties which unite them and the people.

APE (*affe*, German; *aap*, Dutch; *epa*, Welsh). The **QUADRIMANA** (*four-handed animals*) are divided into Old World monkeys, New World monkeys, and lemurs. Again, the Old World monkeys are either *man-shaped* or *dog-shaped*; and it is to the man-shaped monkeys that the name **Ape** is generally applied. Apes have no tails nor cheek pouches, and the hard, bare patches on the buttocks, which distinguish so many of the monkey tribe, are either wanting or very small. They have the same number of teeth as man, namely, four incisors, two canines, and ten præmolars and molars in each jaw, making a total of thirty-two, but there are spaces between, and they are not so regular as in man. The stomach is simple, and the cæcum has a vermiform appendix. The arms are remarkable for their extreme length, and the posterior limbs for their comparative shortness, and their bowed or inward turnure, the knees being turned outward, and the feet articulated at the ankle joint in such a manner that the soles turn obliquely inwards, so as to face each other; they can thus be brought with the utmost readiness to apply themselves to the upright branches or trunks of trees, a firm grasp being thereby insured. On the ground these animals are awkward and waddling; they tread rather on the outer edge of the sole than on the sole itself; while stooping slightly forwards, they use their long sinewy arms as crutches, and by their aid hobble along, often, indeed, swinging the body forwards, resting its weight on the half-closed fists, placed firmly on the ground. The great length of their arms gives these animals peculiar advantages in their native forests; they launch themselves from branch to branch with singular address, and climb to the topmost branches or pass from tree to tree with surprising facility.

The eyes in general appear to be much graver, and less petulant and mischievous, than the ordinary monkeys. When young they are gentle, affectionate, and intelligent; but with maturity they become fierce and intractable. The aspect is melancholy; the lips are very flexible, and capable of extraordinary protrusion.

The *Simiæ* (apes) are divided into three genera—1. *Simia* (ORANG); 2. *Troglodytes* (CHIMPANZEE and GORILLA); 3. *Haplobates* (GIBBON). For an excellent general account of these anthropoid apes as compared with man, see Huxley's "Man's Place in Nature."

APELLES, one of the most celebrated Greek painters, is generally supposed to have been a native of the little island

of Cos in the Ægean Sea. Nearly all that we know about him, with the exception of some few scattered notices, is contained in the 35th book of Pliny's "Natural History." The time of his birth is not fixed, but he was at the height of his reputation about B.C. 332; and as he painted a great many portraits of Philip the father of Alexander he could not be a very young man in B.C. 336, the time of Philip's death. He also survived Alexander, who died B.C. 323. His chief master was Pamphilus, a Macedonian. Of his earliest essays we know nothing, but we are told that his diligence was unwearied, and that he never passed a day without doing something, "*ut non lineam ducendo exerceret artem.*"

A story is told of Apelles as having given rise to the well-known saying that a shoemaker should not go beyond his last. Apelles placed a picture which he had finished in a public place, and concealed himself behind it in order to hear the criticisms of the passers-by. A shoemaker observed a defect in the shoe, and the painter forthwith corrected it. The cobbler came again the next day, and being somewhat encouraged by the success of his first remark began to extend his censure to the leg of the figure, when the angry painter thrust out his head from behind the picture and told the shoemaker to keep to his trade. Apelles excelled in grace and beauty. He only used four colours, as we are told (Pliny). His favourite subject was the representation of Venus, the goddess of love, the female form blooming in eternal beauty; and the religious system of the age favoured the taste of the painter.

Apelles painted many portraits of Alexander the Great, who we are told often visited his painting room. The great picture of Alexander by Apelles was in the temple of Diana at Ephesus; other pictures by Apelles were in Samos and Rhodes, and Rome contained several in the time of Pliny.

AP'ENNINES, the general name for the great mountain system of Italy.

Geographical Position.—The Apennines are a prolongation of the Maritime Alps. Their north-western extremity is situated near the sources of the river Bormida, north of Finale. From this point they stretch in a north-easterly direction until they reach the pass of the Bochetta, due north of Genoa; thence they continue to run eastward, and a little to the south, to the neighbourhood of Pontremoli. Their course has then a general south-easterly direction, but not without some deviations, through the peninsula, at a nearly equal distance from the coasts of the Adriatic and Mediterranean, to Capo di Leuca, on the eastern side of the Gulf of Taranto. From the centre of Calabria a branch extends nearly due south to Cape Spartivento, the furthest extremity of Italy. The length of the chain is about 650 English miles in a direct line; but, including its windings, it is little short of 800 miles.

The general outline of the Apennines presents neither the vertical needles of the Alps, the sharp peaks of the Pyrenees, nor the long rocky cliffs or escarpments of the Jura Mountains; their heights are smooth, rounded, and wavy—bare rocks scarcely ever appearing except in the loftiest parts. The great chain is usually divided into three principal groups, called the Northern, Central, and Southern Apennines.

1. The *Northern Apennines* embrace what are called the Ligurian and Tuscan ranges. Of these (a) the Ligurian Apennines encircle the Gulf of Genoa from the Maritime Alps to Monte Gisa, north of Pontremoli, at the source of the little river Magra. Thence they stretch in a south-easterly direction as far as the borders of Tuscany. The length of this group is about 120 miles; the crest of the mountain chain is from 7 to 30 miles distant from the Mediterranean, and from 30 to 50 miles from the Po. The highest point of the group is Monte Pellegrino, 5161 feet. The seaward slope is abrupt, and much broken by steep

gullies; the landward slope gives rise to the rivers Bormida, Scrivia, Nura, Trebbia, Taro, Grostollo, and Secchia—all tributaries of the Po. The group is crossed by roads at the passes of Montenotte, Bocchetta, and Cento Croci; and the road called the Corniche traverses the coast from Nice to Leghorn. The (6) Tuscan Apennines extend from Monte Pellegrino to Monte Cornaro, in $12^{\circ} 3' E.$ lon., and in a direct line between Florence and Fano, a distance of about 75 miles. In this group the mountain chain approaches nearest to the Adriatic, Monte Cornaro being about 24 miles from Rimini on the Adriatic, and nearly 100 from Orbitello on the west coast. On the western side the mountains throw out numerous branches, and fall gradually towards the Mediterranean. The highest point of the group is Monte Cimone, 7000 feet. The rivers Tiber and Arno rise in this group, which is crossed by two great roads at the passes of Fimalbo and Pietra Mala.

2. The *Central or Roman Apennines* run nearly through the centre of the peninsula, from Monte Cornaro to Monte Velino, which is almost due east of Rome, a distance of about 145 miles. In this group are the most lofty points of the Apennines, viz. the Gran Sasso d'Italia, of which the summit, Monte Corno, is 15,154 feet; Monte Velino, 8210 feet; and Monte Vetora, 8185 feet—all snow-capped throughout the greater part of the year. Several minor branches are thrown off by this group.

3. The *Southern Apennines* extend from Monte Velino to the two extremities of the Terra di Otranto and Calabria, Cape Leuca, and Cape Spartivento. They no longer form one great range, but rather a diverging group of subordinate chains. One of the subordinate chains extends from Monte Chilone to the promontory of Garganum; another from Venosa to Otranto; another from Venosa to Cape Campanella; while the main chain stretches from the neighbourhood of Venosa to the extremity of Calabria, and rises in many places into mountains of great height. The most lofty of the Southern Apennine peaks is Monte Amaro, the summit of the Monte Majella, which is 9150 feet in height.

Geological Structure.—Among the stratified rocks of the Northern Apennines are three great deposits. The lowest is an assemblage of gneiss, mica-slate, clay-slate, tale-slate, and a semigranular limestone; the next, an assemblage of argillaceous slates, marly sandstones, and slates, sandstones, and limestones; and the uppermost consist of a series of marly limestones, and a sandstone called *macigno*, with impressions of marine plants. These strata, together with some partial deposits of conglomerate, are all more or less inclined. Upon them are found, in detached spots of limited extent, deposits of tertiary formation, usually in horizontal stratification. Among the unstratified rocks of Liguria, serpentine is by far the most important. In many parts it forms detached groups of hills. A variety of serpentine, containing a mixture of felspar and dihalage, called in the country *granitone*, is found in several places, and occasionally of a quality that makes it applicable for works of ornament. Near the southern extremity of the Ligurian Apennines there is a distinct group, called the *Alpi Appuani*, separated from the main range by a considerable depression. In this group are situated the celebrated marble quarries of Carrara, the limestone of which is regarded as being of the same geological age as the oolite or Jura limestone, containing fossil remains.

After leaving Liguria, the rock of which the greater part of the Apennines is composed is a limestone which presents itself under different aspects. It contains very few fossils, and affords little interest to the geologist. On the western slope the limestone is mostly covered by tertiary and volcanic products, so that it seldom appears far from the central chain, unless when the subordinate branches rise to

considerable heights. On the eastern side the tertiary deposits do not extend so far south as on the western.

Low hills of rounded undulating forms skirt the northern slopes of the Ligurian Apennines, and cover the greater part of the country on both sides of the Tuscan and Roman Apennines between the mountains and the sea. They have been called by geologists the *Sub-Apennines*, as they never rise above a moderate height. They are composed of marls, covered by yellow sand. Sir Charles Lyell referred them to three different geological epochs. He considered that the tertiary strata of the hill of the Superga, near Turin, as well as the greater part of those in the valley of the Bormida, belong to the miocene period; that the greater part of the Sub-Apennine formations of Northern Italy and Tuscany, and perhaps those around Rome also, belong to the older pliocene period; and that the tuffaceous formations of Naples, the calcareous strata of Otranto, and probably the greater part of the tertiary beds of Calabria, were deposited during the newer pliocene period. The marl of these hills is in some places 2000 feet thick. The sand with which it is covered sometimes passes into a calcareous sandstone. The organic remains found both in the marl and in the sand are very numerous. Among the most remarkable are some found in beds which must have been deposited in fresh-water lakes. They occur in three basins or hollows in the Upper Val d'Arno, where the beds consist of rolled pebbles, sand, clay, and fossil bones. Among the bones are those of the mastodon, elephant, rhinoceros, and hippopotamus. Such is the quantity of elephants' bones that the valley is like a vast cemetery of these gigantic animals, and before the peasants learned to keep these relics for sale they used to inclose their gardens with legs and thigh-bones of elephants.

The volcanic region of the Apennines is nearly confined to the middle part of Italy, and to the western side of it. The volcanic district, properly so called, is bounded on the south by Cape Campanella on the south side of the Bay of Naples, and on the north by the river Ombrone, which enters the sea a little to the south of the island of Elba. The distance between these limits is about 230 miles. Volcanic action has long ceased in every part of this district, except at its southern extremity; and there are no historical records of that action, except with respect to Vesuvius and the country immediately contiguous. The volcanic matter which covers the country is mostly in the state of ashes and cinders, either loose or agglutinated together, forming what the Italians call *tuffa*; but there have been eruptions of solid lava in many places, which are now seen in the form of beds and cliffs of hard rock. See VESUVIUS, VOLCANO.

There are deposits still newer than the volcanic ejections; these are of fresh-water formation, and are an important feature in the physical structure of the country. They are composed of sands, clays, and marls, and of the solid stone called travertine, a corruption of the ancient name for it, viz. *tiburtinum*, because it was found in great abundance near the town of Tibur. All these deposits contain lacustrine shells, particularly such as frequent stagnant waters. The travertine is a deposit from water holding carbonate of lime in solution by means of the carbonic acid which is common in spring waters; by exposure to air the carbonic acid escapes, and the carbonate of lime is deposited. Such springs abound in many parts of central Italy within the volcanic region. There are vast deposits of this travertine, which is used for building purposes. The mountains are poor in metals. A little iron is found, and near Cosenza are some extensive saliferous depots.

It is worthy of remark that the rain-fall on the east of the range is much less than that on the west. As a rule the Apennines present a naked and dreary appearance, due chiefly to the scarcity of water; but at the Riviera of

Genoa, the Gulf of Naples, and wherever water is plentiful, the lower slopes are clad in almost tropical vegetation. Chestnuts, oaks, and corn fields are found at an elevation of 300 feet, and in the valleys beneath oranges, myrtles, figs, and agaves flourish luxuriantly.

APENRADE, a town and seaport, situated at the end of the Gulf at Apennine, an arm of the Little Belt, in the Prussian province of Schleswig, 35 miles north of the town of the same name. It possesses railway communication, has a good harbour, and carries on considerable trade. Ship-building forms one of the chief industries; fisheries are carried on, and there are several manufactures. Apennine has a mild climate, and is a sea-bathing resort. Its environs are very beautiful. The town, which has since suffered much in war, was destroyed by the Wends in 1148. Near it is the castle of Brundlund, erected in 1411 by Queen Margaret. Population, 6000.

APERIENTS are medicines which cause a transient but special irritation of the bowels, followed by alvine dejections. They are most frequently administered by swallowing, or by means of an injection in the lower bowel; but some of them, when applied to the skin over the abdomen, or even injected into a vein, will produce the same effect. The irritation is felt at first merely by the mucous membrane, but secondarily it excites the muscular coat so as to increase the peristaltic and vermicular motions of the intestines. When they affect the membrane merely so far as to occasion a gentle local action, and are followed only by the expulsion of the matter then resting upon it, without altering its nature, the medicines which produce such effect are termed *laxatives*. To these belong the simple aperients, such as prunes, figs, tamarinds, sulphur, and castor oil. But if the action be more considerable, and not only the present contents be expelled by their effect, but also the quantity of the secretions of the canal be increased, and their quality perhaps greatly altered, they are termed *purgatives* or *cathartics*. To this group belong such drugs as aloes, jalap, rhubarb, and senna, and those which are more powerful in their action, such as colocynth, scammony, podophyllum, and also the saline aperients, the tartaric and bitartaric of potash, Rochelle salts, phosphate of soda, Glauber's salts, Epsom salts, &c., though these are generally milder in their application.

Different names are used to distinguish their action, according to the particular secretion which they most obviously augment. Thus those which are supposed to act more especially upon the liver, influencing the flow of bile, such as mercury, taraxacum, and podophyllum, are termed *cholagogues*; those which cause very watery evacuations, such as elaterium, scammony, and gamboge, are called *hydrogogues*; others, which have an influence upon the womb, are termed *emmenagogue* aperients. Those which are very violent in their action are designated *drastic* purgatives.

As many aperients have but a limited action, affecting one portion of the intestinal canal, but having little or no effect upon the rest, they are frequently combined in administration, and thus their effect is rendered more certain. When by their action they give rise to sharp griping pains it is common to combine with them some substance to neutralize this effect, such as ginger, cayenne pepper, an acerbic oil such as peppermint, or a sedative such as opium, benadonum, hyoscyamus, &c.

It is also frequently very advantageous to combine aperients with emetics or with tonics.

APERTURE (or mouth) of the shells of GASTEROPODA presents characters which are useful in classification. The carnivorous Gasteropoda (Siphonostomata) have a tube or siphon for the passage of water into the gills, and this is indicated in the aperture of the shell by the presence of a notch, or the lengthening of that part into a canal; a good example of the notch may be seen in the

common whelk, and of the canal in the beautiful *Murex tenuispina*. In some of the Siphonostomata, e.g. in the scorpion shell (*Pteroceras*), there is another canal for the siphon which carries off the water from the gills. The margin (*peristome*) may be continuous all round, or it may be "interrupted" on the left side by the body-whorl, the peristome existing only as the "outer lip." Most spiral shells are provided with a lid (**OPERCULUM**), which effectually closes the aperture.

APETALOUS PLANTS constitute one of the divisions in Jussieu's "Natural System," comprehending all dicotyledonous genera which have a calyx without corolla. De Candolle added to these all dicotyledonous genera which are without both calyx and corolla, and this arrangement, with few changes, has been adopted by Bentham and Hooker in their "Genera Plantarum."

APHANIPTERA, is an order of insects which includes the flea and the chigoe. See DIPTERA, FLEA, CHIGOE.

APHASIA, the name of a disease of the brain comparatively recently recognized by physicians, which is attended with the loss or impairment of the faculty of language.

It was carefully examined and described by Dr. G. Robertson of Glasgow, but his theory of the cause of the disease differs from that adopted by some other eminent medical authorities. It is generally attended by some other form of paralysis, most commonly that of the right arm and leg; but this is not an invariable rule, as in some cases the faculty of speech is apparently the only one affected. It generally comes suddenly in the form of a "stroke." Sometimes the power of speech is wholly lost, and the patient not only becomes quite dumb but loses also the power of reading and writing. In other cases there is ability to utter words, but no control over them, so that one word is substituted for another, and the person afflicted finds it impossible to express what he means. In the case of a lady afflicted with aphasia, which came under the notice of the writer, it was observed that in speaking to children she reversed the name of the sex and called the boys girls, and *vice versa*. She called the various rooms of her house after the names of different articles of apparel, substituted the word "uncle" for "umbrella," and made similar mistakes generally in conversation without being conscious of saying anything unusual. There is in some cases considerable weakness of the mental powers, involving generally the faculty of memory, but in others they do not seem to be greatly impaired, and the patient feels acutely the loss of the power to express the thoughts and wishes which arise in his mind. In those cases where the aphasia is not attended by paralysis recovery often takes place, generally by degrees, but sometimes almost suddenly. In every case skilled medical advice is most necessary.

APHIDÆ (plant-lice) form, together with the scale-insects (Coccidæ) and leaf-hoppers (Psyllidæ), a division of HEMIPTERA, agreeing in having a sucking mouth without palpi, the wings membranous, and the tarsi of the legs with not more than two joints. The scale-insects are known by the tarsi being one-jointed; the leaf-hoppers by their antennæ of eight to ten joints, and their power of hopping; the aphidæ by their antennæ of five to seven joints.

The plant-lice feed on the juices of plants, to the great injury of the farmer and the gardener, on whose crops many species commit extensive depredation. These insects have the body soft and oval, and some kinds have two tubes at the end of the abdomen for the sweet fluid ("honey-dew") to pass out from the stomach. The beak is three-jointed. The males and females have wings, and also the last brood of sexless individuals, but the early summer broods have no wings.

In the autumn the impregnated females lay eggs. These

remain dormant throughout the winter, and in the early spring they give rise to broods which never lay eggs and have no sexual organs, but nevertheless possess the power of producing young viviparously in an extraordinary degree. Viviparous broods succeed each other so long as food is plentiful and the weather is warm. In this country the changes of seasons do not usually permit more than nine or ten successive broods, but if the tenth brood be placed under favourable circumstances, viviparous generation may be continued for, apparently, an indefinite length of time. For instance, Kyber kept up viviparous generation for four years, and agamic reproduction seemed then to be as active as at any previous period. Under natural circumstances the agamic mode of reproduction is brought to a stop by the scarcity of food and the accession of cold; sexual individuals then appear, and eggs are again laid. The recurrence of fertilization and the deposition of eggs thus seem to be a periodical phenomenon dependent rather upon the seasons than upon physiological causes only. Latreille states that a single female will produce about twenty-five young a day during the summer months, and Professor Owen calculates that one aphid may be the progenitor during its life of the enormous number of 1,000,000,000,000,000,000. Well may the hop-grower dread their appearance.

The pest of the grape-vine, *PHYLLONERA vastatrix*, belongs to the family Aphidæ.

APHIDIPHAGA is a division of beetles which feed on Aphides. See LADY-BIRDS.

APHORISM (*ἀφορισμός*), literally, "a limitation," or "a fixing of limits," and hence used by the Greek writers to express a short sentence, containing a moral precept or a rule of practice, briefly and forcibly expressed. The term has been adopted in medicine. For instance, both Hippocrates and Boerhave have written books entitled "Aphorisms," containing medical maxims not treated argumentatively, but laid down as certain truths. For example, "Neither repletion nor hunger, nor anything which exceeds natural limits, is good." In modern use it is almost synonymous with proverb.

APHRODITE. See SEA-MOUSE.

APHRODITE, the goddess of love among the Greeks, and one of the twelve supreme divinities of Olympus. Homer makes her the daughter of Zeus and Dione, but a more beautiful myth, and much more general, depicts her as springing in full beauty from the foam of the sea (*ἀφροί*). She surpassed all the other goddesses in beauty, and her victory in the Judgment of PARIS was one of the causes of the war of Troy. Her girdle conferred on its wearer the power of exciting love. She was the wife of Hephestus (Vulcan), but was frequently unfaithful to him. [See ADONIS, ARES.] Once Hephestus wove a close fine network of chain, which he threw over Aphrodite and Ares, and held them thus exposed to the laughter of the gods.

Aphrodite represents the reproductive power in Nature, and hence sexual love. Her worship, undoubtedly of Eastern origin, degenerated in later times into gross immorality. The goddess became practically identified with the Phœnician Astarte (Ashtoreth of the Hebrews) and the Roman Venus. Her great temples were in the islands of Cyprus and Cythera, and at Cnidus in Asia Minor.

Aphrodite was the constant theme of the sculptors of antiquity, who represented her in the highest type of female loveliness—sometimes nude, as the Capitoline Venus at Rome, and the Venus de' Medici at Florence; sometimes partly draped, as the Venus of Melos at Paris. The three statues named are the finest representations of the goddess now remaining—the last being beyond question the loveliest figure in the world. See VENUS OF MELOS.

A'PIARY. See BEES.

APIC'CIUS. There were three Romans of this name,

all of them celebrated for their love of good eating. The first was contemporary with Sulla, the second with Augustus and Tiberius, the third with Trajan. Of these the second is the most famous, being celebrated by Seneca, Pliny, Juvenal, and Martial. The expense of his culinary establishment involved him in debt, and he found himself obliged to look into his affairs. He found that, when his incumbrances were cleared off, he should have left a pittance inadequate to keep such a body and soul together; wherefore he took poison in preference to pining after unattainable luxuries. The third Apicius was the inventor of the art of pickling oysters, several jars of which he sent to the Emperor Trajan when in Parthia. Distant as was their destination, they reached it in good condition.

A treatise, "*De Re Culinaria*," is extant under the name of Caelius Apicius. It is considered by critics as ancient, although not written by any of the three whom we have mentioned. Martin Lister republished it in London in 1705, with the title "*De Obsoniis et Condimentis, sive de Arte Coquinaria*." Dr. King imitated it in a poem entitled "*The Art of Cookery*."

APICULATE, in botany, is generally used of the apex of a leaf when it ends abruptly in a sharp point.

A'PION, a Libyan, educated at Alexandria, who, when the Greek inhabitants of Alexandria endeavoured to deprive the Jews who resided there of their privileges, was appointed to advocate their cause against the Jews before the Emperor Caligula.

Apion, who alleged monstrous fables in support of his cause, did not fully succeed. The learned and virtuous Philo, who was at the head of the embassy of the Alexandrian Jews, commenced a reply to Apion's accusation, but the emperor commanded him to leave the imperial presence, and sent Petronius as legate to Syria, with orders to place his statue in the temple of Jerusalem. Petronius marched an army into Judæa, but was so much touched by the entreaties of the Jews not to profane their sanctuary that he requested the emperor to revoke his orders. Caligula granted this revocation to his favourite, Herodas Agrippa, but commanded Petronius to commit suicide for his disobedience. The news of the emperor's death arrived in Syria before the letter in which Petronius was ordered to kill himself. Thus Apion's plan to hurt the Jews was foiled. (Joseph, "*Antiquities of the Jews*.")

A'PIS, a sacred bull, whose temple was at Memphis in Egypt. The sacred bull of Heliopolis was called *Mneuis*. The real or true Apis was known from among all other bulls by certain marks, which are mentioned by Herodotus and Pliny (iii. 28; viii. 46). When the bull Apis died, or had been put to death after living the prescribed number of years (twenty-five according to some authorities), a successor was sought for—jet black in colour, and possessing the sacred square mark on the forehead, the figure of an eagle on the back, and all the other signs—and when found was installed in his temple of Memphis with all due solemnity.

Alexander the Great, when he visited Memphis, sacrificed to Apis, whose worship existed at least as late as the reign of Septimius Severus. We hear of Greeks and Romans of rank at this time paying their respects to the bull of Memphis.

The god Sivas in the Indian mythology has his sacred bulls, which are characterized by certain marks, and a colossal bull of stone is often an ornament of his temples. The bull (but not the cow) is an object of worship still in India. The sacred bulls of Benares still walk about the streets of the holy city, or stop up the road, and must not be disturbed without treating them with all due respect.

The tendency of the Israelites to fall into the idolatrous worship of the bull or cow is seen from the history in Exod. xxxii. Jeroboam, who had spent some time in

Egypt, set up two calves, one at Dan and the other at Bethel, and established temples and priests.

(1 Kings xii.; compare Hosea x.; Bohnen, "Altes Indien," i. 252, &c.; Hardwick's "Christ and other Masters," 1859.)

APLYSIA. See SYCAMORE.

APOCALYPSE. The word apocalypse is Greek, and signifies literally "uncovering," "unveiling," and is used in the New Testament to express especially an extraordinary revelation of the will of God. But the word apocalypse is used, in a more confined sense, to express especially the prophetic revelation of the future development of the Messiah's kingdom.

In the history of the Apocalypse, or Revelation of John, we have to consider who was the author of the work, who calls himself, at the commencement of the first chapter, "Johannes, a servant of the Lord." Some critics have asserted that this description which the author gives of himself is a proof that the Apocalypse was not written by the apostle St. John, but by another servant of the Lord who would not assume any apostolic dignity; and further, that in the usual title of the book he is not called St. John the apostle, but only John *the Divine*, or the theologian. Whoever compares the phraseology, imagery, and doctrine of the Apocalypse with that of the Gospel and the Epistles of St. John will indeed find a great difference. The Greek style of the Apocalypse is strongly tinged with Hebraisms, and its imagery is bold. The style of the Gospel and the Epistles approaches more nearly to the classic Greek, and is almost without imagery.

During the middle ages the anti-catholic sects as well as orthodox divines appealed to the canonical authority of the Apocalypse, although they differed widely in its interpretation; but with the Reformation began another period in the history of the Apocalypse. Erasmus whispered to the learned that we might feel inclined to ascribe the Revelations not to John the Evangelist, if the general consent, and especially the authority of the church, had not already settled its genuineness. What Erasmus hinted, Carstadius and Luther proclaimed boldly to the people. The opinions of the great reformer influenced the Lutheran theology during the sixteenth century so much, that it became habitual to divide the New Testament into canonical and apocryphal books. To the canonical books only was ascribed an absolute authority in matters of faith; and the Apocrypha, to which the Apocalypse was referred, were considered as subsidiary sources of information. The reformers of Geneva, Calvin and Beza, seem to be more favourable to the Apocalypse. They quote it often without mentioning the Lutheran estimation of canonical and apocryphal books of the New Testament. Calvin in his "Institutio Religiæ Christianæ" uses the Apocalypse as canonical and apostolical. On the authority of these reformers the Apocalypse was sanctioned as a name in the "Confessio Helvetica Posterior," the "Thirty-nine Articles of the Church of England," the "Confessio Gallica," and "Conf. Belgica."

APOCARPOUS, in botany, is a term applied to flowers & fruits when the carpels are distinct.

APOCRYPHA. This word is derived from the Greek, and originally meant secret or concealed. It was used in the early church to designate such writings as contained the secret doctrines of the Gnostics and other sects, and which were communicated to their partisans only. It was also used to describe such works as had a hidden meaning, those whose origin and authorship were unknown, and those which, though non-canonical, were regarded as being useful and profitable for moral instruction. The word is now generally used with the latter signification, to express those writings which were introduced into the Septuagint translation of the Old Testament, whereas they were transmitted into the Vulgate; and more

seldom to describe those works which sprung up in great abundance during the early years of the church, such as the Gospel of the Infancy, the Gospel of Nicodemus, &c. With regard to the apocryphal writings connected with the Old Testament the degree of estimation with which they have been regarded has varied very greatly. In the earliest period they were treated by the Greek fathers as being part of the inspired writings, while other parties in the church, following the Hebrew canon, carefully excluded them from the sacred and canonical Scriptures. At the Council of Laodicea, held A.D. 360, the Greek Church formally excluded them from the canon; but on the other hand the Latin church continued to retain them, and the question as to their authority remained an open one until the period of the Reformation. The reformers, with Luther at their head, decided against the canonicity of these books, and Luther placed them between the Old and New Covenants, under the title of Apocrypha, declaring that though profitable to the reader, they were not to be regarded as being equal to Holy Scripture. The Church of Rome, on the other hand, at the Council of Trent (1545-63) finally adopted them as being part of the Old Testament, and of equal authority with the rest, and pronounced the customary anathema upon all those who refused thus to receive them.

The Established Church of England, while it does not apply them to establish any doctrine, yet recommends them to be studied for instruction of manners and example of life, and appoints certain portions to be read in public worship; but all other Protestant churches, both in England and America, omit them altogether from public services. In former times it was customary to bind the Apocrypha between the Old and New Testaments; but about 1821 a debate arose in the British and Foreign Bible Society as to the propriety of printing the Apocrypha together with the Holy Scriptures, and in 1826 the Society decided that it would no longer circulate it. Most of the Bibles now published are without the Apocrypha, and this has led to its being issued by some of the publishers as a separate work. The titles of the various books, as given in the English Bible, are—(1) 1 Esdras; (2) 2 Esdras; (3) Tobit; (4) Judith; (5) The rest of the Book of Esther; (6) The Wisdom of Solomon; (7) The Wisdom of Jesus the son of Sirach or Ecclesiasticus; (8) Baruch the Prophet; (9) The Song of the Three Holy Children; (10) The History of Susanna; (11) The History of the Destruction of Bel and the Dragon; (12) The Prayer of Manasses, King of Judah; (13) 1 Maccabees; (14) 2 Maccabees.

With regard to the date and authorship of these works but very little is known. They were most probably written during the first and second centuries B.C., and they display, in an instructive and interesting manner, some of the influences at work upon the Jewish mind during that period. Some of the books appear to have been composed in Babylon or Persia, others in Alexandria, and others in Palestine itself, and they thus afford some means of estimating the influence of Persian and Greek thought upon the Jewish system of theology.

The apocryphal writings connected with the New Testament having been rejected at a very early period, are much less known, and out of the large number which were written comparatively few are now extant. Of these the most important are the Epistles of Clement, Polycarp, and Barnabas, and the Shepherd of Hermas, all of which were at one period accepted by large sections of the church as being of canonical authority, and read in common with the other books of the New Testament in public worship, as well as the apocryphal gospels, consisting of the Protevangelium of James, the Gospels of the Infancy, and the Acts of Pilate or Gospel of Nicodemus. Of the latter the Protevangelium contains a number of legends concerning

the birth and early life of Mary, the Gospels of the Infancy contain many of the stories of the childhood of Jesus which have been current from the second century in the East, while the Acts of Pilate or Gospel of Nicodemus give an account of the crucifixion and resurrection, together with the descent of Christ into hell, and the events which thereon ensued. There are a number of other works extant of a similar character, such as the apocryphal Acts of the Apostles, and apocryphal Revelations.

These works have but little interest for the general reader, and many of the stories they contain are grossly absurd, and stand out in striking contrast when compared with the canonical books. They possess, however, considerable interest for ecclesiastical and biblical scholars, and an extensive literature has grown up around them. They have been published with a valuable preface by Tischendorf, and have been translated into English by Mr. Walker, and published in "Clark's Ante-Nicene Christian Library," vol. 16 (Edinburgh, 1870). The scattered fragments of the lost Gospel to the Hebrews have been collected by Mr. Nicholson, some time librarian of the London Institution.

APOCYNACEÆ (the periwinkle family). This order of plants, belonging to the **MONOPETALÆ**, consists of trees or shrubs with milky juice. The five lobes of the corolla are unequal-sided, giving the flower a twisted look; in the stamens the filaments are distinct, and the anthers adhere to the stigma; the carpels are more or less separate in the ovary, but combine in the hourglass-shaped stigma. The plants are chiefly natives of the tropics, but a few species occur in temperate climes. The periwinkles (*Vinca major* and *Vinca minor*) are the only representatives in Britain. The milky juice and the seeds generally contain a virulent poison; a kernel of the Madagascar ordeal tree (*Tanghinia*) is sufficient to kill twenty people. The common *Nerium Oleander* is poisonous in every part. The natives of Ceylon have a tradition that the forbidden tree of the Garden of Eden is their *Tabernaemontana dichotoma*; they point to the fragrant flowers and the tempting fruit, retaining still the mark of Eve's teeth, and affirm that the fruit which was at first "good for food" then became poisonous. In some species the juice is milder, and with caution may be employed medicinally; in some few others it is quite innocuous. The cow-tree of Demerara (*Tabernaemontana utilis*) produces an abundant supply of a drinkable fluid, thick, sweet, and milky. Caoutchouc is obtained from the milky juice of *Urceola elastica* of the East Indies, and of many other plants. A Brazilian *Hancornia* furnishes a pleasant fruit, and *Carissa carandas* of the East Indies is used to make a conserve like red-currant jelly. Among the stove-plants belonging to this order are *Nerium*, *Allamanda*, *Dipladenia*, *Echites*, and *Plumiera*.

AP'OGEE (from ἀπὸ, from, and γῆ, the earth), an astronomical term applied to the apparent orbits of the sun and moon, signifying the points of those orbits which are at the greatest distance from the earth.

APOLLINARIS or **APOLLINARIUS**, a native of Alexandria, taught grammar at Berytus (Beirut), a town on the coast of Phœnicia, and afterwards in Laodicea of the same country. Apollinaris married and became presbyter of Laodicea. His son, likewise called Apollinaris, was one of the greatest orators, poets, and philosophers of his age. Apollinaris, the younger, became professor of eloquence at Laodicea before A.D. 385, and afterwards lecturer of the Christian congregation. Both father and son were friends of Libanius, who was a heathen, and attended the lectures of Epiphanius the Sophist, who then taught at Laodicea. Georgios, bishop of Laodicea, being an Arian, banished them, either on account of their continued intercourse with

Epiphanius, or on account of their adherence to the Nicene Creed and the friendship of the younger Apollinaris for Athanasius. When Julian forbade the Christians to interpret the Greek classics, both father and son composed imitations for the use of schools.

The younger Apollinaris was orthodox bishop of Laodicea A.D. 362, whilst Pelagius was bishop of the Arians in that city. Apollinaris distinguished himself especially by polemical and exegetical writings; for instance, by his work on Truth, against the Emperor Julian and the heathen philosophers. Jerome, during his residence at Antioch (A.D. 373 and 374), enjoyed these exegetical instructions.

Apollinaris, who had defended the Athanasian doctrine of the Trinity, himself subsequently incurred the reproach of heresy, because he taught that the divine *logos* occupied in the person of Christ the place of the human soul. According to him Christ was *ἑνσάρκως*, "incarnate," but not *ἁψυχος*, "insoled." His disciples were called Apollinarists. His heresy became known A.D. 371, but it was first condemned at the synod held at Rome A.D. 375.

Before the death of Apollinaris, which happened about 382, the Apollinarists formed several separate congregations with their own bishops. After his death they were divided into two parties, one of which, under Polemius, pretended that the divinity and the body of Christ were one substance, and consequently that the flesh was to be worshipped as well as the *logos*; these were called Polemians and Synonians, and also *Sarkolatæ*, "flesh-worshippers," and *Anthropolatæ*, "men-worshippers." The other party, which adhered to the original doctrine of Apollinaris, were called Valentinians.

By imperial command the public worship of the Apollinarists was impeded A.D. 386, and entirely prohibited in all towns A.D. 428. The sects of the Apollinarists assimilated in the fifth century partly to the orthodox and partly to the Monophysites. See **ERYCINIANS**.

APOL'LO, one of the twelve supreme gods of the Greeks, also called Phœbus, and by Homer most commonly Phœbus Apollo. He was the son of Leto (Latona) by Zeus (Jupiter), and the twin brother of Artemis (Diana). Leto, driven from place to place by the jealousy of Hera (Juno), found rest and shelter for a moment in the island of Delos, a floating rock which took firm root on this occasion; and here she was delivered of Apollo and Artemis, at the foot of Mount Cynthus, under the shade of an olive tree. The relentless Hera drove her hence, and the children-gods were perforce abandoned. The goddess Themis took charge of Apollo, and fed him with the food and drink of the gods, ambrosia and nectar, so that at once he rose to full stature and strength, and passing from the care of Themis, demanded a lyre and a bow, declaring that henceforth he would reveal the will of Zeus to men.

Apollo was pre eminently the god of the Greeks—his numerous and varied attributes all springing from their central conception of him as the god of light. By later poets he was regarded as the sun-god himself; but in Homer and Hesiod Apollo and Helios (the Sun) are two distinct divinities. The rays of the sun are the arrows of Apollo, and as they fall quicken life and feeling; but shot in anger they wither and destroy. Corresponding to the external light of the world the Greeks recognized the internal light of the mind; and combining the physical and mental conceptions, we can clearly trace the origin of attributes otherwise so discordant. Apollo is the god of music, of poetry, of medicine, of science, of prophecy therefore, as well as of youthful beauty and worldly prosperity; he is the protector of cattle as well as the lord of pestilence. His name Apollo is, indeed, from his fiercer attribute (ἀπολλύναι, to destroy), as Phœbus (φαιβος, shining) is from the beneficent side of his character.

The many myths of which Apollo is the principal figure

will be found separately told elsewhere in this work. See **PYTHON**, **NIOME**, **DAPHNE**, **TROY**, **MIDAS**, **MARSYAS**, &c.

There has been some controversy as to the origin of the worship of Apollo; although it has been contended that it was introduced from Egypt, the balance of probability is that he was a purely Dædic divinity, whose first temples were at Tempe and Delphi, and whose worship was introduced into Attica from Cete (whither it had spread) by the immigration of the Ionians. The oracle of Apollo at Delphi was the most celebrated in the world; the divine *afflatus* (stream of vapour) rose from a chasm over which was placed the tripod, whereon sat the priestess. The broken phrases she uttered were connected into meaning, generally of double sense, by the priests. [See **ORACLE**.] The oracle was consulted even so late as the time of Julian (A.D. 363), and was not suppressed until Theodosius (A.D. 390). It was to guard his shrine at Delphi, given to him by Themis, the protectress of his infancy, that he attacked and slew the monstrous dragon Python (whence another of his surnames, Pythios), in honour of which the Pythian games were instituted, and after some changes celebrated every five years by the Greeks.

Apollo was said to have been once driven from heaven for attacking the Cyclopes, the sons of Zeus. Admetus, king of Ploëe, received him kindly, and Apollo served as his herald—declining, however, when his time of banishment was over, and revenging Admetus in various ways. [See **ADMETUS**.] Another punishment he had to undergo was to assist Poseidon (Neptune) in lulling Troy for Læonæon.

Besides Delphi, Apollo had oracles or shrines of great fame at Delos, Tenos, Chios, near Colophon, Delyna, near Miletus, Patma, &c., in Asia Minor, and at Abæ in Phœcis, Ithaca near Thbes, and many other places in Greece.

The Romans began his worship in 430 B.C., when a temple was erected to him during a plague, and under the emperors it grew to great favour. Augustus founded to the honour of Apollo, and to commemorate his own great victory over Mark Antony, the games of Actium, to be held, like the ancient Pythian games, every five years.

Apollo is generally represented in the prime of youth, of elegant and finely-proportioned figure, with a countenance of perfect beauty, but at the same time expressing a commanding intelligence, the forehead lofty, and crowned by long wavy hair, often in part knotted above the head. Sometimes the bay or laurel crown is upon his head, and generally either bow or lyre is in his hand. See **APOLLO BELVEDERE**.

APOLLO BELVEDERE, a celebrated statue of Apollo, found at Capo d'Anzio, in the ruins of ancient Antium, about 32 miles from Rome, towards the end of the fifteenth century. It was purchased by Pope Julius II. before his elevation to the pontificate, and was placed by him in the Belvedere of the Vatican, whence it derives its present name. It has been said to be the work of Agasius the Ephesian, but no certain indications of the sculptor are to be traced. Even the name of which the statue consists is a subject of contention, experts differing as to whether it is Greek or Italian.

This statue, one of the finest specimens of sculpture extant, is a standing figure more than 7 feet high. It represents the god entirely nude, except the cloak which is fastened round his neck, and hangs over the extended left arm. He is advancing with a dignified step, and holds something raised in his left hand. The left hand and the right arm were restored by Giovanni Angelo da Montorsoli, a pupil of Michael Angelo, so that the original action of the figure can only be conjectured. It was formerly supposed to represent the god at the moment of having disengaged an arrow at the dragon Python, watching the effect

of his weapon; and accordingly, in the restoration, part of a bow was placed in the left hand. A serpent, emblematic of the healing art, is fixed on the stump of the tree which gives stability to the figure. According to the most recent interpretation the god originally held in his hand, not the bow, but the *Ægis*, with which he is supposed to be in the act of striking terror into the Celts, who have dared to attack his sanctuary at Delphi. This view is based upon a statuette, evidently a copy of the original bronzo from which the Apollo Belvedere (like so many of the most famous antiques) was itself taken, now in the Stroganoff collection at St. Petersburg. Stephani, in 1860, pointed out that the left hand of the statuette held some elastic substance, certainly not a bow, but very possibly the *ægis*. In 279 B.C. Pausanias relates that the god himself, with Athene and Artemis, drove away the barbarian intruders amidst a dreadful storm, in the darkness of which the gleaming gorgon's head could be seen. Rocks fell from the mountains, the earth shook, and spectres of departed heroes mingled in the fray. "The Apollo Belvedere therefore may represent the god as, with the proud consciousness of invincibility, he holds up the *ægis*, and marks with a mingled expression of scorn and satisfaction its terrible effect on the ranks of the Greeks. . . . The self-reliant severely contemptuous look suits well the bearer of an irresistible weapon" (Perry, "Greek and Roman Sculpture," Lond. 1881). We know that statues of the three divinities of great excellence were presented by the grateful Greeks to Delphi; and the celebrated Artemis of the Louvre (*Diane à la Biche*) and the Athena in full armour of the Capitol, have been conjectured to be the remaining statues, on account of their remarkable fitness as companions to the Apollo.

Yet another theory as to the meaning of this "miracle of art," as Winckelmann calls it, explains the attitude of the god, and the presence of certain leaves, knots of wool, and tassels on the supporting tree-stump already alluded to, as derived from the act of purifying Orestes with the sacred *stemma delphikon*, which was composed of twigs of laurel bound with knots of scarlet wool and ending in a tassel. Just such a scene, when Apollo holds the bow in one hand and the purifying *stemma* in the other, occurs in the "Emmenides" (Furies) of Æschylus, when Orestes is acquitted of the murder of his mother. This is the view of Bötticher, Feuerbach, and Brunn.

It is certainly extraordinary that not a single allusion to so splendid a work of art should occur in any classical writer known to us.

APOLLODORUS, an Epicurean philosopher mentioned by Diogenes Laertius. He flourished about 80 B.C.

APOLLODORUS OF DAMASCUS, a celebrated architect and engineer, was born about A.D. 60. He designed and executed most of those splendid edifices and great works of engineering with which the Emperor Trajan delighted to adorn and improve his dominions, and of which some remains exist and are admired at the present day—such as the column of Trajan, the ruins of his forum, the triumphal arch of Benevento, the triumphal arch, the bridge, and the harbour of Ancona, and probably also the best part of that triumphal arch which was finished and appropriated by Constantine, but which is believed to have been commenced by Trajan. The greatest engineering work of Apollodorus was the immense bridge of Trajan over the Danube, afterwards destroyed by Hadrian. On the accession of the latter emperor, Apollodorus was implicated in a charge of treason, and was executed A.D. 130. There seems no good reason for believing him guilty of the charge.

APOLLONIUS, sculptor of the famous Torso of Heracles or Torso Belvedere, one of the principal treasures of the Vatican. An inscription on the statue records the sculptor's name, who probably flourished in the last cen-

tury before our era. It has neither head, arms, nor legs, and yet it is considered one of the masterpieces of antiquity. Michael Angelo was an enthusiastic admirer of it, and all agree that it is one of the finest specimens of ancient sculpture. It was discovered in the sixteenth century, near the theatre of Pompey.

APOLLO'NIUS, a celebrated statuary of the island of Rhodes, who, along with Tauriscus, executed a group in marble which represented Zethus and Amphion binding Dirce to the horns of a furious bull, to avenge their mother, Antiope, whom she had cruelly persecuted. This group, described by Pliny (xxxvi. 4), is supposed, with much probability, to be what is known to us under the name of the Torso Farnese, found during the reign of Paul III. in the ruins of the Baths of Caracalla, and now in the museum at Naples. The lower half of the figure of Dirce, the two trunks and a leg of Zethus and Amphion, were the only remnants of the ancient sculptors, but it is sufficient to prove that the art was then in its highest degree of perfection; and as the necessary restoration was effected under the superintendence of Michael Angelo, the effect of the whole group is almost unsurpassed.

APOLLO'NIUS was also the name of several illustrious Greek poets, grammarians, and philosophers.

APOLLO'NIUS, surnamed MOLO, was a teacher of rhetoric at Rhodes, and was sent on an embassy to Rome (B.C. 81), where he became the tutor of Cicero, by whom he was highly esteemed.

APOLLO'NIUS the Sophist, who lived at Alexandria in the time of Augustus, was the author of a valuable lexicon of Homeric words, which is still extant. (Bekker, Berlin, 1833.)

APOLLO'NIUS the Dyscolos (or ill-tempered) of Alexandria, lived under Hadrian and Antoninus Pius in the second century. He was the first to systematize grammar, and was styled by Priscian *grammaticorum princeps* (the prince of grammarians). He was the author of several works, some of which still remain. (Bekker, Berlin, 1817.)

APOLLO'NIUS, PERGE'US, after Archimedes the most original and profound of all the Greek geometers, and indeed commonly called by the ancients the "great geometer," was born at Perga in Pamphylia, while Ptolemy III., commonly called Euergetes, was king of Egypt. Ptolemy began his reign B.C. 247. Archimedes died B.C. 212, at which time Apollonius was living; it is not known when the latter died.

The life of Apollonius was passed at Alexandria, in the school of the successors of Euclid, under whom he studied. Gassendi, in his life of Copernicus, mentions an opinion attributed by the latter to the Grecian geometer, and which is said to have been also that of Philolaus, that the sun and moon only moved round the earth, but all the other planets round the sun. This, so far as appearances only are concerned, is a sufficient explanation of all the phenomena, and is the soundest of the Greek astronomical hypotheses, next to the system of Pythagoras, who brilliantly guessed (what many centuries after was proved by Copernicus) that the whole of our system moves round the sun.

The "Conic Sections" of Apollonius, his great geometrical work, was in eight books, the four first of which are extant in Greek, with the commentary of Eutocius of Ascalon. The next three were supposed to be lost till the middle of the seventeenth century, when James Goliuss, a celebrated Oriental professor of Leyden, returned from the East with the whole seven books, which still remain to us of the original eight, in Arabic. Introductory lemmata to all the eight, in Greek, by Pappus still exist, and are found in the great folio Oxford edition, 1710. Apollonius was the first who used the words *ellipse* and *hyperbola*, of which Archimedes does not take notice, though he

uses the term *parabola*. He also first distinguishes the *diameters* of the section from the *axes*. It was moreover in his time, and perhaps first by himself, that the *general* sections of the cone were considered; for previously it had been usual to treat only of those the planes of which were at right angles to one of the sides of the cone; so that an ellipse could only come from an acute-angled cone, and so on. The fifth book, and the quadrature of Archimedes, are the highest points of the Grecian geometry. That Apollonius improved the notation of arithmetic appears from the praise given to him by Eutocius in his commentary upon the quadrature of Archimedes. Pappus states that the improvement consisted in a simplification of the method proposed by Archimedes for representing very large numbers, which brought the system nearer to that of the moderns. (Delambre, "Hist. Ast. Anc." ii. 9.) Eutocius also says that Apollonius extended the quadrature of the circle given by Archimedes.

APOLLO'NIUS OF TYANA was born B.C. 4 in Tyana, a town of Cappadocia. At the age of fourteen his father sent him to Tarsus to study grammar and rhetoric. Dissatisfied with the luxury of the citizens, Apollonius retired to Egæ, where he became acquainted with the doctrines of various philosophers. He observed the Pythagorean rules strictly, took up his abode in the temple of Esculapius at Egæ, famous for miraculous cures, abstained from animal food and wine, lived upon fruits and herbs, walked barefoot, and let his hair and beard grow. The priests initiated him in their mysteries, and said that Esculapius himself rejoiced at having Apollonius for witness of his cures. Having finished his studies at Egæ, Apollonius travelled by land to India. At Navech he met with Damis, who became his travelling companion. On his road to India he visited Babylon, and in India he saw many wonderful things, and conversed with the gymnosophists, who showed him that the wisdom of Pythagoras came from their country. On his return to Asia Minor he prophesied and performed many miracles. He afterwards went to Crete; and in the reign of Nero he arrived at Rome. When Nero left Rome for Greece, he ordered all foreign philosophers to quit the city. Apollonius furthermore was under suspicion of having restored a corpse to life. He left the city, and travelled through many countries, amongst them Spain, Athens, Egypt, and Ethiopia. In Egypt he joined Vespasian, who probably found it politic to gain over a man whose sanctity and miracles had raised him to the rank of a deity; for during his lifetime, and still more after his death, Apollonius enjoyed this distinction. ("Life of Alexander Severus," by Lampridius, cap. 29.) His reputed sonship of a god (Proteus), the divine annunciation of his birth to his mother, the miracles abundantly testified to during his life, the sacred voice which called to him at his death are striking parallels with the gospel narratives, and seemingly without motive. The Eclectics set him up as a rival divinity to Jesus, amongst others. Apollonius died at an advanced age, how old is not precisely known, either at Ephesus or at Lindus, in the temple of Pallas. Wonderful to relate, he escaped unharmed from an arraignment for treason against the tyrannous Domitian.

The history of Apollonius is contained in his life by Philostratus. The first two books exist in the English translation by Charles Blount (Lond. 1680, fol.) In 1693 this translation was suppressed on account of the annotations being hostile to Christianity, and Blount committed suicide. Philostratus wrote the Greek original about a century after the wise man's death, by order of Julia Domna, the wife of Septimius Severus. The empress had obtained possession of the account which Damis had formerly given to a relative of hers. A passage in the "Life of Aurelian" (chap. 24), by Vopiscus, who flourished about A.D. 300, shows that the fame of Apollonius was even then firmly

established, and that temples and statues still existed in honour of this "true friend of the gods," as the historian calls him.

APOLLONIUS OF TYRE, the hero of a metrical Greek romance, of which the original is now lost, but which was very popular during the middle ages, having been translated into most of the European languages. The story consists of the adventures of Apollonius, a Syrian prince, and of his wife and daughter, who, after being separated, owing to the apparent death of the wife and the capture of the daughter by pirates, are at the close of the poem again happily reunited. There are three early Latin versions of this poem, one of which is to be found in the "Gesta Romanorum," and from these have proceeded the Italian, Spanish, French, and probably the German versions of the story. In England an adaptation of this narrative into the Anglo-Saxon was made as early as the eleventh century, and three stories taken from the French version were published in 1510, 1576, and 1607. Gower in his "Confessio Amantis" bases his narrative on a Latin version of the story, and he is followed by Shakespeare in his drama of "Pericles, Prince of Tyre." The Spanish and German adaptations both date from the thirteenth century.

APOLOGETICS, the name given to that branch of systematic theology which deals with the defence of Christianity against the objections of scepticism, infidelity, and the various opposing systems of philosophy. For the works of the fathers of this character see *APOLOGUES OF THE FATHERS*. During the medieval period very few works of this description were published, but on the revival of learning in the fifteenth century the principles of the Platonic philosophy and those of Christianity appeared to be in antagonism, and works were written by Christian scholars in defence of revelation. The ferment of thought brought about by the Reformation also led to many attacks upon the system of Christianity, the person of Christ, and the institution of the church—a state of things which has continued to the present time, and there has been a continued series of works in reply by both Protestant and Roman Catholic scholars and divines. Among Christian apologists may be mentioned Grotius, Butler, Paley, Lardner, Watson, and in more recent times Neander, Tholuck, and Luthardt among Protestants; and Pascal, Berzler, Mayr, and Chateaubriand among Catholics.

APOLOGIES OF THE FATHERS are writings in defence of Christianity, composed from the beginning of the second to the sixth century, with the view of refuting the doctrines of heathenism and the false accusations against the followers of Jesus, and averting persecution.

Justin Martyr described in two Apologies how he sought for truth in various systems of philosophy until he found it in the gospel. In his dialogue with the Jew Trypho, he appeals to the prophecies of the Old Testament. Athenagoras defended the Christians against the charges of atheism, incest, infanticide, and other abominations. Tatianus, Theophilus of Antioch, and Hermas proved the absurdity of paganism and the contradictions of philosophers, in order to show the necessity of revelation.

After these Greek apologists of the second century followed among the Latins, Tertullian, who, in his "Apologetics," shows how the faith and holiness of Christians were manifested under persecutions; and Minucius Felix, who, in his eloquent dialogue "Octavius," introduces the representatives of various parties, whose arguments are overcome by the truth of the gospel. Cyprian wrote "On the Absurdity of Idolatry." These apologists of the second century did not defend the systems of certain schools, but only the truth of Christianity.

In the third century the doctrines of the gospel were systematized by Origen among the Greeks, and Arnobius

among the Latins, in order to defend them against the attacks of Celsus, Porphyry, and Hierocles, which were directed not only against the morals of the Christians, but also against their history and their doctrines. The greatest apologist among the fathers is Eusebius, whose historical and chronological works have an apologetical tendency. His "Evangelical Preparation" contains, in fifteen books, the introduction to his "Evangelical Demonstration," in twenty books. The first ten books of this work are still extant, in which he seeks to demonstrate the harmony of the Old with the New Testament, the moral dignity of Jesus, and the rectitude of his disciples. Eusebius examines (in a little publication against Hierocles) the life of Apollonius of Tyana by Philostratus, shows the contradictions of the biographer, and distinguishes the miracles attributed to Apollonius from those of Christ. The works of Athanasius and Chrysostom contain apologetical materials. Cyrillus of Alexandria wrote ten books in reply to the Emperor Julian. Theodoret wrote twelve sermons, in which he gathers the arguments for Christian truth from the writings of the heathens, and compares the Greek philosophers with Moses, the prophets, and the apostles. The most important apologetical works among the Latins are the seven books of Arnobius, "Against the Heathen;" the seven books of Lactantius; the twenty-two books of St. Augustine, "On the City of God;" the catalogue of St. Jerome, by which he refutes the objection that no distinguished individuals embraced the gospel; and finally, "The History of Orosius," in which he refutes the assertion that plague, famine, earthquakes, and other horrible events, were consequences of the gospel.

The following translations and editions will be interesting to English readers. Justin's Apologies were published at Oxford, 1700 and 1703; his "Dialogus cum Tryphone Judæo" at London, 1722. "The Dialogue with the Jew," by Brown (London, 1755), is an excellent translation, and very scarce in the book market. Minucius Felix, of the third century, author of "A Dialogue between Cæcilius, a Heathen, and Octavius, a Christian," is well translated by Sir David Dalrymple.

APOLOGUE, synonymous with fable (Gr. *apologos*, Lat. *fabula*, fable), "a novel story contrived to teach some moral truth" (Johnson). "It would be a high relief . . . to hear an apologue or fable well told, and with such humour as to need no sententious moral at the end to make the application" (Shaftesbury, "Character," vol. iii.) It is essential to an apologue that it should be fictitious. Some say that it must involve an impossibility, as in "Æsop's Fables," where we find beasts and inanimate things made to think and speak.

APOLOGY (Gr. *apologia*), a word originally signifying a defence made in a court of justice by or for a person accused. There is extant a small piece attributed to Xenophon, entitled the "Apology of Socrates," and another with the same title by Plato. The word apology was adopted by the Christian fathers. [See *APOLOGIES*.] At the present day it is only used in ordinary language in one sense, that "of asking pardon or excuse for some offence." But the word has occasionally been used in the early Christian sense, as by Bishop Watson in his "Apology for the Bible," by Barclay in his "Apology for the Quakers," and by Cardinal Newman in his "Apologia pro Vita sua."

APOPHTHEGM (Gr. *apophthegma*), a word signifying "a thing spoken out," and in its more technical sense, a pithy saying calculated to arrest the attention. "Certainly apophthegms are of excellent use. Cicero prettily called them *salinas* (salt-pits), that you may extract salt out of and sprinkle it where you will. They serve to be interlaced in continued speech" (Bacon). The following quotation may serve as an example of an

apophthegm—"Bigotry murders religion, to frighten fools with her ghost" (Colton's "Lacon"). Plutarch made a collection entitled "The Apophthegms of Kings and Generals," and dedicated it to the Emperor Trajan. Many of these apophthegms would be classed in modern times among anecdotes.

The Lacedæmonians were specially noted for affecting the apophthegmatic mode of speech; and Plutarch has collected their sentences also, under the title of "Laconica," whence our term *laconic* used to characterize this style of conversation.

APOPLEXY, a sudden and dangerous fit brought on by the rupture of a bloodvessel in the brain, and the consequent effusion of blood and formation of a clot there. Though the attack itself is generally sudden, the sufferer falling down insensible in a moment, it is in most cases heralded by certain premonitory signs, and is generally the result of the long-continued operation of various exciting causes. The latter may be looked for in hereditary tendency, in physical conformation, and in mode of life. The large head, short neck, full chest, and sanguine and plethoric temperament have from time immemorial been considered as forming the apoplectic constitution; and though the disease may, and often does, occur in the very opposite state of the system, there is no doubt such a conformation of the body is especially liable to an attack. Luxurious living, especially when combined with sedentary habits, is a most powerful predisposing cause, and the same must be said of habits of intemperance and the indulgence of violent emotion. Cases frequently occur in which persons drop down suddenly in a fit during a paroxysm of anger. It is more common among men than women, and most frequently occurs in the period between forty and seventy. Out of sixty-three cases which were noted two were between twenty and thirty; eight from thirty to forty; seven from forty to fifty; ten from fifty to sixty; twenty-three from sixty to seventy; twelve from seventy to eighty; and one from eighty to ninety. The condition of all others most conducive to apoplexy is that in which, at a somewhat advanced age, the food habitually taken is large in quantity and rich and stimulating in quality. The premonitory symptoms of an attack are usually drowsiness and dulness of mind; pains in the head, attended with giddiness and a feeling of weight and fulness; dulness of hearing, with rumbling noises in the ears; dimness of sight, double vision, and the appearance of motes and sparks before the eyes; coldness or numbness in the hands and feet, and a feeling of heat about the head. These symptoms may be attended with loss of memory, and feelings of great depression or irritability, with a diminished secretion of urine, and a confined state of the bowels. Most of these symptoms may be experienced separately from quite other causes than those which bring on an attack of apoplexy; but where there exists any tendency to this disease, such signs should be regarded as warnings, and receive prompt attention. Such persons should carefully avoid excess in any direction—eating, drinking, exercise, and mental emotion or labour. Any confinement of the throat should be avoided, and the head should not be held long in any stooping posture. Straining, the use of hot baths, and indeed anything that would tend to send the blood with undue impetus to the head, or would impede its return, should be carefully avoided. The bowels must be kept open, and where there is a low state of health tonic medicines will prove of advantage.

The signs of an attack are generally the absence of sense and motion, the sufferer lies as if asleep, the face is flushed, the breathing heavy, and the pulse beats fully, but more slowly than usual. Sometimes the fit is attended with pain in the head, convulsions, giddiness, and vomiting; sometimes it begins in paralysis and ends in apoplexy,

while at others the apoplexy passes into paralysis. The treatment of this disease must obviously vary with the pathological conditions of the brain, on which it depends. The skill of the physician consists in detecting what that condition is, and in adapting his remedies to it, and as the state both of brain and system varies in every individual case the treatment must be modified accordingly.

Whenever a person is seized with a fit of apoplexy he should be carried into a large room, all fastenings round the neck should be undone, and the body should be placed in a reclining position, with the head well raised and supported. The freest possible circulation of fresh air should be promoted around the body, and the head should be sponged with cold water, or, better still, a bag of ice should be applied, and mustard poultices may be placed on the calves of the legs. Medical assistance should be sought for instantly, and every observer of such a case should bear in mind that loss of life may be the result of the loss of a minute.

An attack of this kind is always very dangerous, and in many cases death follows at the end of a few hours, the patient remaining quite unconscious from the time of the seizure. In cases where recovery ensues there always remains a tendency to a similar attack, and great care is necessary to prevent it.

APOSTATE, a term originally used to designate any one who changed his religion, from any motive whatever, but which is now used only in an invective sense, and implying unworthy motives. In the early church the term included those who rejected Christianity from conviction, as well as those who abandoned their profession from fear of persecution. Thus the Emperor Julian is styled "the Apostate," because having been brought up as a Christian, and having had St. Gregory Nazianzen and St. Basil for companions in study, he deliberately preferred the noblest form of paganism to Christianity. Those who forsook their faith during times of persecution were called *sacrificati* when they had offered sacrifices to the gods, and *thurificati* when they had made an offering of incense only. When the persecutions subsided many of these desired readmission to the church, and the question as to whether this should be permitted caused much fierce controversy amongst the members. Many were of opinion that such persons had forfeited all hope of salvation, but the more merciful view, which permitted a return upon public expression of penitence, generally prevailed. At a later period the Roman Catholic Church imposed the penalties of excommunication, confiscation of property, banishment, and even death upon those who became apostates. The term is now sometimes used in connection with political matters to designate any sudden change in opinion prompted by self-interest.

APOSTLES (Gr. *apostoloi*, one who is sent forth) is the name given in the New Testament, and in Christian literature, to those twelve disciples whom, according to Luke vi. 13, Jesus chose from the number of his followers to be his companions, and whom he commissioned to preach the gospel, at first to Jews only (Matt. x. 5, Luke ix. 2), but after his resurrection to the Gentiles also (Matt. xxviii. 19, Mark xvi. 15). The lists of the names of the apostles occur in Matt. x. 2, Mark iii. 16, &c., Luke vi. 14, &c., and Acts i. The names were Simon Peter, Andrew (his brother), James (the son of Zebedee), John (his brother), Philip, Bartholomew (called also Nathanael), Thomas, Matthew, James (the son of Alphaeus), Thaddæus (called also by Luke Judas, the son or brother of James), Simon (the Canaanite or the Zealot), and Judas Iscariot. The apostasy and death of Judas having left a vacancy, Matthias was chosen by lot to fill the place (Acts i.) The number was further increased by the addition of Saul, whose name among the Greeks was Paul, and who became pre-eminent the apostle of the

Gentiles. The title of apostle is also given twice to Barnabas, the colleague of Paul, in the 14th chapter of Acts, but here the word seems to be used in its more general signification of messenger. It is evident from the epistles of Paul to the Galatians and Corinthians that there existed a party in the church which disputed his claim to the apostleship, but his authority was recognized by the other apostles (Gal. ii. 9). It is worthy of note also that in the Book of the Revelation, chap. xxi., where the New Jerusalem is described, it is said, "The wall of the city had twelve foundations, and on them twelve names of the twelve apostles of the Lamb." The book of the Acts of the Apostles is chiefly taken up with the work of Peter and Paul, and very little is known as to the after-life and work of the rest of the apostles, with the exception of James and John. After a stay of some years in Palestine they all appear, with the exception of James, to have departed into different districts of Syria, Asia Minor, and Greece, and very early traditions associate the names of Andrew with Scythia, Bartholomew with India, Philip with Phrygia, Thomas with Parthia, and Peter with Rome, though the latter point has been contested by Protestant scholars. It was generally believed in the early church that they all, with the exception of John, died as martyrs for the faith.

In old paintings, and in the pictures used in the adornment of consecrated buildings, the several apostles are designated by symbols emblematic of their office and work or of their martyrdom. Thus St. Peter is usually represented with two keys, St. John with a cup having a winged serpent flying out of it, and St. James the Greater with a pilgrim's staff and a round bottle; while St. Paul is represented with a sword, St. Andrew with the cross named after him, St. James the Less with a flower's club, St. Bartholomew with a knife, St. Philip with a long staff having a cross at the upper end, St. Matthew with a hatchet, St. Simon with a saw, St. Jude with a club, St. Matthias with a battle-axe, and St. Thomas with a spear.

The question as to whether the authority and office of the apostles ceased with their death, or was handed on to successors, is one that has been very largely discussed. The latter view arose very early in the church, and both Irenæus and Tertullian regarded the episcopate as a continuation of the apostolic office. This is the theory adopted by the Church of Rome and the Established Church of England, while the opposite opinion, viz. that the apostolic power and authority ceased with the death of its first possessors, is generally adopted and maintained by the Presbyterian, Independent, Baptist, Methodist, and other free churches of England and America.

APOSTLES' CREED. See CHURCH.

APOSTOLIC CATHOLIC CHURCH. See under IRVING, EDWARD.

APOSTOLIC FATHERS are those teachers of the Christian Church who lived in the first two centuries, and who derived their knowledge from the apostles. Of these there are six whose writings, or portions of them, are extant, viz. Barnabas, Clement of Rome, Hermas, Ignatius, Polycarp and Papias. The chief works of these fathers are the general epistle of Barnabas, two epistles to the Corinthians by Clement, eight epistles by Ignatius, and "The Shepherd" by Hermas. The genuineness and authenticity of most of these writings have been much contested, and while those which remain of Clement, Polycarp, and Papias are generally accepted, the remainder, though undoubtedly written at a very early period in the history of the church, are considered to be of doubtful authenticity.

APOSTOLICI or APOSTOLIC BROTHERS, a sect founded by several different sects which have arisen during the history of the church, of which the first is that mentioned by Epiphanius (Hæres. 67). Another sect

became very numerous on the banks of the Lower Rhine about the middle of the twelfth century. Their doctrines under this name foreshadowed in many respects those of Protestantism. They accepted the central tenets of Christianity, but rejected the authority of the pope, the taking of oaths, infant baptism, fasts, ritual worship of saints, the belief in purgatory, masses, second marriages, &c. These opinions soon aroused the anger of the ecclesiastical authorities, and some of them were brought before the court of the Archbishop of Cologne. Here they maintained a disputation for three days, defending their principles by appropriate quotations from Scripture. They were ordered to forsake their opinions and to conform to the church, but firmly refused, and were thereupon committed to the flames, and the sect appears to have been suppressed by persecution.

A still more famous brotherhood was founded about the year A.D. 1260 by Gerhard Segnelli, a weaver of Parma. He was a man of an enthusiastic religious temperament, and had at one time aspired unsuccessfully to become a member of the Franciscan order. He devoted himself to study and meditation, and becoming deeply impressed with the corruption and vice which he saw around him, endeavoured to stem the tide by urging a return in doctrine and practice to the methods of the apostles. Clad in rough and simple costume he travelled about preaching repentance to the people, and for a period of twenty years he was unmolested by the church. At the end of this period, having gained a considerable number of adherents, the authorities became alarmed, and he was arrested by order of the Bishop of Parma. He was released from prison in the year 1286, and continued his mission in spite of the commands of the pope. With their increasing numbers the brethren became emboldened to assail the excessive worldliness, pride, and corruption which then degraded the papacy, and rejected the authority of the pope. In 1300 Segnelli and many of his followers, both men and women, were burned at the stake for their opinions. Another leader, however, came forward in his place, in the person of Fra Dolcino, a man of great force of character, who had received a good education, and had been trained for the priesthood. In 1305 he withdrew with a large company of his followers to the Val Sesia in Piedmont, where he long resisted the forces sent against him by the pope. Eventually, however, being reduced by heavy snow and consequent famine, he was defeated and taken prisoner, and after sustaining the most horrible tortures with unflinching bravery, he was burned to death. His fate was shared by his companion, the lovely Margaret of Trent. His followers were dispersed, and the sect gradually dwindled away, though there were a few remaining upwards of fifty years after these events. Dante alludes to Dolcino in the "Inferno" (xxviii.).

APOSTROPHE (Gr. *apostrophe*), a "turning away," or "a sudden change in our discourse, when without giving previous notice we address ourselves to a person or thing different from that to which we were addressing ourselves before" (Beattie, "Elements of Moral Science"). The term is also used less properly for an address to some absent or inanimate object, as in "Julius Cæsar," Act iii. Sc. 1—

"O pardon me, thou bleeding piece of earth,
That I am meek and gentle with these butchers."

It is also used to express the contraction or elision of part of a word, as *boro* for *borough*, *learn'd* for *learned*. The comma by which the final *s* of the genitive case is separated from the word is also called an apostrophe, as in "Israel's monarch."

APOTHECARIES, SOCIETY OF, one of the incorporated companies of the city of London.

The word *apothecary* is from the French *apothicaire*,

which is defined by Richelet to be "one who prepares medicines according to a physician's prescription." The word is from the Low Latin *apothecarius*, and that is from the genuine Latin *apotheca*, which means a store-house or store-room generally, and more particularly a place for storing wine in; the Latin word is, however, from the Greek (*apothēkē*).

In England in former times an apothecary appears to have been the common name for a general practitioner of medicine, a part of whose business it was, probably in all cases, to keep a shop for the sale of medicines. In 1345 a person of the name of Coursus de Gangeland, on whom Edward III. then settled a pension of sixpence a day for life for his attendance on his Majesty some time before while he lay sick in Scotland, is called in the grant printed in Rymer's "*Fœdera*," an apothecary of London. But at this date, and for a long time after, the profession of physic was entirely unregulated.

It was not till after the accession of Henry VIII. that the different branches of the profession came to be distinguished, and that each had its province and particular privileges assigned to it by law.

In 1511 an Act of Parliament (3 Henry VIII. c. 11) was passed, by which it was ordered that no one should practise as surgeon or physician in the city of London or within 7 miles of it until he had been first examined, approved, and admitted by the Bishop of London or the Dean of St. Paul's, who were to call in to assist them in the examination "four doctors of physic and of surgery, and other expert persons in that faculty." In 1518 the physicians were for the first time incorporated and their college founded, evidently with the view that it should exercise a general superintendence over all the branches of the profession. In 1540 the surgeons were also incorporated and united, as they continued to be till the beginning of the present century, with the barbers.

It was found necessary in 1543 to pass an Act (34 & 35 Henry VIII. c. 8) for the toleration and protection of the numerous irregular practitioners who did not belong to either body, but who probably formed the ordinary professors of healing throughout the kingdom. The import of the enactment is expressed in its title, which is "An Act that persons being no common surgeons may minister outward medicines." The persons thus tolerated in the administration of outward medicines of course comprehended those who kept shops for the sale of drugs, to whom the name of apothecaries was now exclusively applied. The acceptance of the name as thus confined may be gathered from Shakespeare's delineation of the apothecary in "*Romeo and Juliet*" (published in 1597), as one who kept a shop and who was resorted to as a dealer in all sorts of chemical preparations. Nothing is said of his practising medicine; and it certainly was not till nearly a century later that apothecaries in England, as distinguished from physicians and surgeons, began regularly to act as general practitioners.

Meanwhile, however, the apothecaries of London were incorporated by James I. on the 9th of April, 1606, and united with the Company of Grocers. They remained thus united till the 6th of December, 1617, when they received a new charter, by which they were formed into a separate company, under the designation of the "Master, Wardens, and Society of the Art and Mystery of Apothecaries of the city of London." This charter ordains that no grocer shall keep an apothecary's shop; that every apothecary shall have served an apprenticeship of seven years; and before he is permitted to keep a shop or to act as an apothecary he shall be examined before the master and wardens to ascertain his fitness. It also gave the company extensive powers to search for and destroy in the city of London or within 7 miles compounds and drugs which were adulterated or unfit for medical use. This is the charter which still constitutes

the society one of the city companies, although subsequent Acts of Parliament have materially changed its original character.

It appears to have been only a few years before the close of the seventeenth century that the apothecaries, at least in London and its neighbourhood, began gradually to prescribe as well as to dispense medicines. Addison, in the "*Spectator*" (No. 195, published in 1711), speaks of the apothecaries as the common medical attendants of the sick, and as performing the functions both of physician and surgeon. This encroachment was strongly resisted by the College of Physicians, who by way of retaliation established a dispensary for the sale of medicines to the poor at prime cost at their hall in Warwick Lane.

The apothecaries themselves contended at this time for permission to practise as medical advisers and attendants, only so far as circumstances seemed to render it indispensable. In a clever tract written in their defence published in 1724, and apparently the production of one of themselves, entitled "*Pharmacopolæ Justificatio; or the Apothecaries vindicated from the Imputation of Ignorance*," &c., the following opinion is expressed (p. 31):—"As to apothecaries practising, the miserable state of the sick poor, till some other provision is made for their relief, seems sufficiently to warrant it so long as it is confined to them."

It has been often stated that the dealers in medicines called chemists or druggists first made their appearance about the end of the last century. As they soon began to prescribe as well as to dispense, the rivalry with which they were thus met was as eagerly opposed by the regular apothecaries as their own encroachments had in the first instance been by the physicians. It is to be doubted, however, if the first appearance of these interlopers was so recent as has been assumed. In a tract, printed on a single folio leaf, "at the Star in Bow Lane in 1683," entitled "*A Plea for the Chemists or Non-Collegiats*," the author, Nat. Merry, stoutly defends the right of the manufacturers of chemical preparations to administer medicines, against the objections of the Apothecaries' Company, who seem to have been themselves at this time only beginning to act as general practitioners. And in 1708 we find a series of resolutions published by the Court of Apothecaries, in which they complain of the intrusion into their business of foreigners—that is, of persons not free of the company. Their charter, though it appeared to bestow upon them some what extensive privileges, had been found nearly inoperative from the omission of any means of executing its provisions, and of any penalties for their infringement. In 1722, therefore, an Act of Parliament was obtained by the company, giving them the right of visiting all shops in which medicinal preparations were sold in London or within 7 miles of it, and of destroying such drugs as they might find unfit for use. This Act expired in 1729, and although an attempt was made to obtain a renewal of it the application was not persevered in. But in 1748 another Act was passed empowering the society to appoint ten of their members to form a court of examiners, without whose license no one should be allowed to sell medicines in London or within 7 miles of it. This Act probably had the effect of putting the unlicensed dealers down, which may account for the common statement that no such description of dealers ever made their appearance till a comparatively recent period.

Up to within the present century the Society of Apothecaries had never attempted to get their authority extended beyond the metropolis and its immediate neighbourhood. But in 1815 an Act was passed (55 Geo. III. c. 194) which placed the society in a new position, by giving to a court of examiners, composed of twelve members of the society of not less than ten years' standing, the sole right of examining and licensing apothecaries throughout England and Wales. The Act provided that the examiners should

be appointed by the master, wardens, and assistants of the society, and that candidates for examination should have attained the age of twenty-one, and have served an apprenticeship of at least five years with an apothecary.

By an Act passed in 1874, entitled the "Apothecaries' Act Amendment Act," these restrictions were modified, the choice of examiners being no longer confined to members of the society, while the condition of apprenticeship was repealed. Powers were given to the society to combine with any other licensing body in conducting medical examinations, and of striking off from their list of licentiates any person who had been convicted in England or Ireland of any felony or misdemeanour, or in Scotland of any crime or offence, or who should after due inquiry be judged by the General Council to have been guilty of infamous conduct in any professional respect.

In Ireland there is also an Apothecaries' Company, known as the Apothecaries' Hall, which was incorporated by an Act passed in 1791 (31 Geo. III. c. 34). It gave a monopoly to the licentiates of this hall in the compounding and selling of medicines, but this has been neutralized by other Acts relating to chemists and druggists. The Medical Act of 1858 gave the licentiates of the Apothecaries' Society of London, and of the Apothecaries' Hall in Ireland, the right to practise in future in all parts of the United Kingdom.

In Scotland there never has been any class of practitioners like the apothecaries of England or Ireland, and the term there is given to a seller of medicines and drugs, and corresponds with the English chemist and druggist.

APOTHECIA (Gr. *apothēkē*, a storehouse) are receptacles in **LICHENS**, in which are formed the asexual reproductive bodies called *spores*. They are produced within the substance of the lichen, and only appear later above the surface; they then either expand in the form of shallow cups (gymnocarpous lichens), or emit the spores through a small opening at the top (angiocarpous lichens).

APOTHEOSIS (Gr. *apothēōsis*, a deification, literally a god-making, the enrolment of a mortal among the gods).

- The mythology of Greece is full of instances of this; it is sufficient to mention *Minos*, *Heracles*, and other *heroes* who received divine honours. It was one of the doctrines of *Pythagoras* that good men after death were raised into the order of gods. *Alexander the Great*, not only claimed divine parentage, but a divine nature while on earth; and the complement of deification was commonly paid to the princes of the various dynasties who succeeded to his empire. One of the *Seleucida* was called *Antiochus Theos*, that is, "God." In *Rome* also we find *Romulus* raised to the rank of a god; but there are no other instances of *Romans* admitted as deities from the expulsion of *Tarquin* until the empire of the *Cæsars*. *Julius Cæsar* was worshipped as a god (*divus*) after his murder. *Augustus* and many of the succeeding emperors were enrolled, after death, among the inhabitants of *heaven*.

The term *apothēōsis*, however, is more especially used to signify the ceremony by which the *Roman emperors* were admitted after death to divine honours. The ceremony is minutely described by *Herodian* (lib. iv. c. 3).

The *Egyptian*, *Persian*, and *Phœnician* theologies seem to offer no trace of the idea of *apothēōsis*.

APOTOME, in music, the greater semitone of the *Pythagoreans*. The *Pythagorean* musical system had only one set of tone, the major tone (with the ratio 8:9); and their emotion they made by subtracting their Third (made of two major tones) from the perfect Fourth. Consequently the second of *limma* was a smaller interval than our semitone, and they used it to divide the tone. The remainder was called the *apotome* (literally "that which is cut off"); so that a *limma* and an *apotome* made up a major tone between them. See *GUTHRIE MUSIC, INTERVAL*.

APPALACHIAN MOUNTAINS. The Appalachian system runs along the eastern side of the continent of North America, and includes the chain of the Alleghanies. It consists of numerous parallel chains, some of which form detached ridges, extending in most instances in the same direction as the entire system which they contribute to form. Taken as a whole, it has a range which does not deviate materially from N.E. to S.W., and it extends about 1200 miles in length, from Maine to Alabama. The chief chains of mountains which form the system are the following:—The Blue Ridge, which lies nearest to the Atlantic; the Kittatinny Chain; the Alleghany Mountains, in the western part of Virginia and the central parts of Pennsylvania; the Cumberland Mountains, on the eastern boundary of Tennessee and Kentucky; the Catsbergs, or Catskill Mountains, in the state of New York; the Sacondago Chain, which is a continuation of the Catsbergs; the Green Mountains, in the state of Vermont; the Highlands, eastward of the Hudson River; and the White Hills, in New Hampshire. In the whole of the Appalachian system there are no great detached mountain peaks. The most elevated among them are *Clingman's Peak* (6941 feet) and *Mount Mitchell* (6782 feet) in the Black Mountains, North Carolina; *Mount Washington*, in the White Mountains, New Hampshire (6652 feet); and *Tahawus* or *Mount Marcy*, in the Adirondacks, New York (5167 feet). None of the summits reach the line of perpetual snow.

The Appalachian Mountains do not form a high dividing line between the waters which flow into the Atlantic on one side, and into the Mississippi on the other. They cover a widely-extended area of about 100 miles in breadth, only one-third of which is occupied by the mountain chains, the rest being the intermediate valleys. The rivers which rise in the Appalachians flow in long valleys between the chains, and are deflected sometimes to the east and sometimes to the west, after passing nearly at right angles through depressions in the ridges or through deep rents in the mountains. The line of the great water-shed, between the streams that flow to the Atlantic and those that flow into the Gulf of Mexico, runs from the sources of *St. John's River*, on the north-western limit of the state of Maine, to the Point of Florida, almost following the inflection of the coast. The land between the sea-coast and the foot of the most eastern of the Appalachian chains is of very unequal breadth. At the Hudson River the Atlantic almost washes the base of the mountains, but from that point southward there is a gradual increase in the breadth of the Atlantic Slope, as it is called by the American geographers, as far as *Cape Hatteras* in North Carolina; and from that point to the mouth of the *Altamaha*, in Georgia, the coast runs nearly parallel to the mountains, at a distance of about 200 miles. The western slope of the Appalachian system falls by a gentle but broken descent to the Mississippi; it is upwards of 1000 miles in length, and about 300 miles in width from the river to the base of the mountains, covering an area of about 300,000 square miles, unbroken by any other than gently rising hills, but deeply furrowed by rivers over its whole surface. The only lake of importance is *Lake Champlain*, in the northern portion of the range.

In the northern parts of the Appalachian system a considerable tract of country is occupied by primary strata, such as *gneiss*, *mica-slate*, *clay-slate*, and *granular limestone*, associated with *granites*, *serpentine*, and *traps*, under various aspects, underlying and penetrating the strata. *Grauwacke* sandstone and *slates* and *transition limestones* are, however, more abundant in this mountainous range than the primary strata. *Transition limestone* occurs over a great extent of country along the north-western side of the Alleghany chain, associated with the *grauwacke slate*, but generally lying beneath it. It contains many caves,

some of which are of great extent, and in these caves fossil bones of various animals have been found. Arenaceous and conglomerate grauwackes are perhaps the most frequent forms in which the transition rocks present themselves.

In Pennsylvania there is a vast deposit of coal, associated with sandstones and slates. The coal of that quality is generally called *blind coal* or *anthracite*. One of these coal-fields, in the valley of Wyoming, is 60 miles long by 5 broad; a second is in the valley of the Lehigh river; and others on the Schuylkill, the Susquehanna, and the Lackawanna. Besides these beds of anthracite coal, there are others of bituminous coal in the Alleghanies of Ohio.

Natural springs, extremely rich in salt, are found all along the western slope of the Appalachian system; and from Onondago, in New York, to the southern termination of the mountain system, wherever the earth has been penetrated to any considerable depth, salt water has been found; in some places, where the boring was from 300 to 400 feet, the water rushed up with so much force as to rise like a fountain several feet above the surface of the ground. Extensive oil-wells are worked in the region of Pennsylvania.

The secondary formations of Europe, between the coal-measures and the chalk, are of very rare occurrence along the Atlantic Slope. In New Jersey and Delaware there is a very extensive deposit of an argillaceous marl, containing, however, but a small quantity of lime. The country which intervenes between the mountains and the Atlantic is mostly covered with tertiary deposits. These deposits have been classed as the *Lower*, the *Middle*, and the *Upper*. The lower tertiary is met with at the western boundary of the Atlantic Slope; the upper tertiary extends to the shores of the ocean. This last also occupies by far the greatest extent of surface. Remains of the mastodon and megatherium have been met with in alluvial accumulations above the tertiary deposits.

Among the unstratified rocks granites, sienites, and serpentines occur; columnar basalt and other trap rocks are also met with. Among the mineral products are iron (which is found in large quantities), lead, gold, silver, and copper. Marble, fire-clay, gypsum, limestone, and salt are exceedingly abundant.

When America was first discovered by Europeans an almost unbroken forest spread over and around the Appalachian Mountains, and it extended to the Atlantic Ocean, the Gulf of Mexico, the St. Lawrence, and west of the Mississippi. The trees growing on and near the mountains are the oak, the pine, the hickory, the sugar and other maples, the Weymouth pine, the hemlock spruce, the laurel, the magnolia, the liriodendron, and many others. Bears, wolves, and other wild animals are met with in large numbers.

APPALACHICOLA, a river of Florida, in the United States, formed by the junction of the Flint and the Chattahoochee, and flowing for a distance of 70 miles into the Gulf of Mexico. The latter branch, which is the larger, has a navigable course for about 400 miles from the sea. The town of *Appalachicola* is a seaport at the mouth of the river, with a trade in cotton.

APPARENT, in astronomy. When it is necessary or convenient to reduce an observed phenomenon, either by clearing it from the effects of any optical delusion, or substituting for it the phenomenon which would have been observed at some more commodious station, that which is actually observed is called the *apparent* phenomenon, in opposition to that which results from correction or reduction.

APPARITION. The mind affects the body, and the body affects the mind; and some insight may be obtained into the disordered states of the mind by considering the physical conditions which are necessary to sound thought.

It is not true, as is commonly supposed, that we see with the eye, and hear with the ear, and taste with the tongue. The true seat of these sensations is the brain, and the eye, the ear, the tongue, are organs adapted to receive impressions from external objects, which impressions are transmitted from the organs by an appropriate apparatus to the brain, where they become sensations. When an object is presented to an organ of sense it produces a change in the nerves of that organ. This change is conveyed by the nerves to the brain; a corresponding change is occasioned in the brain, and through the brain in the mind; and it is this change in the mind which is expressed by the term sensation. Ideas, on the contrary, are copies of sensations, renovations of prior feelings, in general differing from sensations in being less intense.

The functions of the brain, then, are sensation, and if the analogous term be allowed, ideation, together with the action and reaction of these two states on each other, known under the name of intellectual operation. The main instrument by which intellectual operation is carried on is what is termed association. It is a property of the mind to combine and unite the sensations and ideas it receives in such a manner that, after this combination or union has been once formed, if any one of these sensations and ideas be revived, the single sensation or idea so revived will immediately call up to view all the sensations and ideas that had previously been connected with it; and this power of association, as long as its action is sound, is observed to operate in a uniform and determinate manner, generally in the order of sensation. Thus, if the sensations A B C were impressed upon the mind in the order of these letters, B will re-excite not A, but C. If the rapidity of the succession of the trains of ideas pass beyond a certain point, instead of distinct there is confused thought. In like manner, unless the trains of ideas recalled by association possess a certain degree of vivacity, they present to the mind an indistinct assemblage of images; if, on the other hand, they are too vivid, they are equally incapable of forming the elements of sound thought.

In order that the brain may carry on these operations, that is, in order that it may receive the impressions conveyed to it by the nerves from the organs of sense; in order that it may convert these impressions into sensations; and in order that it may duly combine and revive them—it must be in a sound state. The chief agents which maintain the brain in such a state are its organic nerves and its circulating vessels. Like every other organ it is maintained in a healthy condition by the organic process of nutrition, over which the system of nerves termed organic preside. If these organic nerves become disordered, disease may take place in the substance of the brain, and this disease may assume a variety of forms far too great to be enumerated here, the slightest of which may be incompatible with the production of sound thought. If, on the other hand, the flow of blood through its circulating vessels be deranged, the process of thought may be equally disordered. Stop the flow of blood to the brain altogether, insensibility will follow instantly, fainting will supervene, and this state will be quickly succeeded by death, unless the vital current be readmitted. Quickened the circulation beyond a certain point, insensibility equally follows; and, though the preternatural velocity of the circulation should stop short of inducing insensibility, it may yet disturb the ordinary process of thought in an infinite variety of modes.

Now there is scarcely a single disease which is not capable of disturbing, in a greater or less degree, the action of the organic nerves of the brain; but the maladies which most commonly and remarkably disturb the functions of these nerves are certain diseases of the abdominal viscera, particularly of the alimentary canal, and more especially of that portion of it which forms the stomach; certain

diseases of the liver and of the mesenteric glands, and of the urinary and reproductive organs. In like manner excitation or depression of the action of the bloodvessels of the brain, beyond a certain point, uniformly disorders sensation and all the mental operations. Striking illustrations of both are afforded by the effect of many physical agents, as well as of natural diseases. Of the first the effects of the inhalation of nitrous oxide affords an example. When this gas is received into the lungs the pulse is increased in strength, fullness, and velocity. A corresponding change takes place in the mental impressions. Sensation becomes more vivid; the sensibility to touch increases; luminous points dazzle the eye; the hearing is more acute; recollections, generally of a pleasing nature and of uncommon intensity, pass rapidly through the mind. One individual compares his feelings, under the influence of this gas, to those which he experiences when witnessing a heroic scene upon the stage; another likens them to the emotions he felt when he heard several hundred instruments playing at one time at one of the Handel festivals held at the Crystal Palace.

In the same way, in certain diseases of the brain attended with excitement, persons exhibit a remarkable capability of reproducing and combining images of external objects; and whoever will consider carefully the mental phenomena produced by the different and opposite conditions of the brain in such cases, the one produced by the operation of a physical agent, the other arising under the influence of disease, will have no difficulty in conceiving the origin of spectral illusions, either with the consciousness that they are illusions, or with a temporary or permanent persuasion that they are real existences, and whether arising from external or internal causes, or both combined.

Certain states of the body, and certain affections of the mind, powerfully predispose to the intense renovation of past impressions, however those impressions have been induced, and whatever their nature; the immediate exciting cause of the renovation being often some external object acting upon the senses or upon the imagination under circumstances favourable to the illusion. A large class of spectral illusions are referable to this head.

APPEAL. This word is derived immediately from the French *appel* or *apel*, which is from the Latin *appellatio*. The word *appellatio*, and the corresponding verb *appellare*, had various juridical significations among the Romans. It was used to signify a person's applying to the tribunals for their protection; and also generally to signify the calling or binding of a person into court to answer for any matter. Under the empire *appellatio* was the term used to express an application from the decision of an inferior to a superior judge on some sufficient ground. The first title of the 49th book of the "Digest" is on Appeals (*De Appellationibus*). In the French language, the word *appellant* signifies he who appeals, he who makes an appeal from the decree or sentence of an inferior judge; and both words have the same sense in the English.

Appeal, in its modern sense, is the removal of a suit from a lower to a superior court, that the latter may affirm, reverse, or alter the judgment of the former. The Romans introduced several grades of jurisdiction, the ultimate remedy being an appeal to the emperor; hence Paul when brought before him, appealed to Cæsar—that was, to the supreme judge at Rome who represented the emperor. In the middle ages strenuous efforts were made to bring almost all important causes within the canon law, and to render the pope the ultimate end of the various grades of appeal. As this, however, would have overriden the civil power, it was constantly resisted, and the decisions of the civil appellate judges—who were but the nominees of the lay sovereigns—were eagerly preferred rather than the reference of causes to a foreign power.

In course of time, however, the wealthier and more powerful vassals of the king, demurring to the decisions of the royal courts, sought recourse for final judgment to their own order, embodied as the great council or parliament of the nation, and hence arose the appeal to the House of Lords as the court of last resort. The jurisdiction of the House was thus of feudal origin, but became gradually of a popular character—the "High Court of Parliament" being looked to by the humblest suitor for justice, when it was refused in the baronial court, or even by the king's judges.

In the deliberations from 1873 to 1875 which preceded the passing of the JUDICATURE ACT of the latter year, a strong feeling was manifested in favour of discontinuing what had become simply a fiction of ultimate appeal, so far as regarded its centring in the "House of Lords;" and it was proposed to erect a supreme court of appeal which might be located, with the various divisions of the High Court, in the new Palace of Justice.

In 1876, however, the government introduced and passed through Parliament the Appellate Jurisdiction Act, by which the ultimate court of appeal is to continue to bear the name of the House of Lords. But it is easy to see that its chief claim to this title is the fact that the court holds its sittings in the peers' legislative chamber, for if the ancient powers and positions of lay peers are not in so many terms abrogated, they are in substance by the fact that the Act clearly indicates who the appellate judges are to be, and provides for sittings out of session at which ordinary members of the house have no right to attend.

The Supreme Court of Appeal, as constituted by the Act, consists of the lord-chancellor, ex-chancellors, and peers who are or have been judges, and four "lords of appeal," appointed for the purpose, who have the full privileges of peers so long, but only so long, as they hold office. The sittings of the court are independent of the sittings of the House of Lords, so that justice is not now delayed by the intervals of parliamentary sessions or by political crises.

The Judicial Committee of the Privy Council is also a final court of appeal, chiefly for admiralty and ecclesiastical causes, and from the courts of the British colonies and dominions abroad. There is an evident tendency, however, to absorb these judicial functions in the one supreme court of ultimate appeal for all causes, ecclesiastical as well as civil. Section 14, in fact, of the Act of 1876 points strongly to this by providing that additional lords of appeal may be created on vacancies occurring among the paid judges of the privy council, and by providing for the attendance of the archbishops and bishops at the Supreme Court (House of Lords) as assessors in ecclesiastical cases.

Appeals lie from the Justices of the Peace in England on settlement and other cases to the Quarter Sessions, and thence to the Queen's Bench Division; and in special cases direct from the Justices to the Queen's Bench. They also lie in cases above £50 from the county courts to the superior courts. In Scotland appeals are allowed from the sheriff's court to the Court of Session (but only in cases where the value is above £25), from the lord ordinary to the Inner House of the Court of Session, and from the Court of Session to the House of Lords.

In the old criminal law of England "appeal" was a vindictive action at the suit of the party injured, in which suit the appellant, instead of merely seeking pecuniary compensation, as in civil actions, demanded the punishment of the criminal. It was in the power of the appellant alone to relinquish the prosecution, either by releasing his right of appeal or by accepting a compromise. It was chiefly known in practice as the privilege of the nearest relation of a murdered person, and was generally employed when the public passions were roused against the accused

on account, not so much of the evidence against him, as the atrocity of the crime. In the case of Slaughterford, in 1708, public indignation was aroused by the merciless manner in which the charge of murdering the woman he had seduced was pressed against him. The evidence was very slight, and he was acquitted on indictment; but an appeal was brought, and the accused was then convicted and hanged, as his execution was a privilege belonging to the prosecutor, of which the crown could not deprive him by a pardon. If, however, the accused were an able-bodied man he had the choice of two ordeals, combat or a jury, the former being known as the "wager of battle." In 1818 one Abraham Thornton was prosecuted by William Ashford for the murder of his sister, Mary Ashford, and when put upon his trial Thornton pleaded "Not guilty, and I am ready to defend the same by my body;" and thereupon taking his glove off, he threw it upon the floor of the court—thus claiming the right of wager of battle. Ashford, a small feeble man in comparison with the stalwart Thornton, declined the physical ordeal, and appealed to the law; but the court, not being able to gainsay the resuscitated ancient right, Thornton escaped unpunished. Public attention was roused by such a miscarriage of justice, and in the following year, by 59 Geo. III. cap. 46, trial by battle was abolished, together with the old privilege of criminal "appeal" above described.

APPENZELL, one of the twenty-two Swiss cantons. It lies at the north-eastern extremity of Switzerland, and is inclosed on every side by the territory of the canton of St. Gall. The whole extent of the canton is about 152 square miles, and its population in 1880 was 61,799. Appenzell is, next to Geneva, the most thickly inhabited canton of Switzerland, in proportion to its extent. Its territory is very mountainous, though it is not within the range of the higher Alpine chains; the mountains are calcareous, and mostly covered with rich pastures; the highest of them, called the Sentis, on the southern border of the canton, is 8232 feet above the level of the sea. The extensive forests which formerly existed have to a great extent disappeared. Wood for fuel, however, is still abundant, as well as peat. The climate of the canton is healthy, though cold and changeable.

The river Sitter, which has its source at the foot of this mountain, crosses Appenzell in a north-western direction, and afterwards joins the river Thur in the canton of Thurgau. Appenzell produces little corn, and has no vineyards except on some of the eastern hills, which slope towards the valley of the Rhine. Numerous herds of cattle and flocks of sheep feed on the high lands. Butter, cheese, honey, and wax are the chief produce. In the northern and western districts manufactures of linen, cotton, muslins, damask, &c., afford employment to a great part of the population.

Before the Reformation the whole canton was under one government, but at that period, part of the inhabitants having embraced the Protestant faith whilst the remainder continued Catholics, violent disputes were kindled between them, which, after much contest, were settled by a singular compromise. By an agreement in 1597 the canton was divided into two portions—*Rhodes Interior* and *Rhodes Exterior*—and it was stipulated that the former should be appropriated to the Catholics and the latter to the Protestants. Accordingly the two parties separated and formed two independent democratical republics, each having a separate system of government, police, and finance. The representatives of the two divisions, however, meet together annually for purposes of legislation. Both republics have but one vote in the Swiss Diet, and send their deputy by turns.

The Catholics number about 16,000, the Protestants about 48,000. The chief towns are—Appenzell, the capital

of the Catholic part of the canton; Trogen, the chief town of the Protestant district; and Herisau, at both of which latter there are manufactures of muslin and linen. Gais, on the south side of Mount Gabris, and other places, are annually frequented by a large number of invalids to drink whey and breathe the pure air of the district. The inhabitants, who speak a peculiar dialect, are fond of athletic games and music, and are good marksmen. Numerous schools, as well as benevolent and charitable institutions, exist.

APPENZELL, the chief town of Inner Rhoden, in the above canton, stands in a beautiful situation on the river Sitter, 9 miles S. of St. Gall. Though inferior to most Swiss towns in its architecture, it has an old church, where some ancient banners and an immense collection of skulls are kept; two convents; and a council-house. The inhabitants, who are mostly Roman Catholics, number about 4000, and are largely engaged in the manufacture of embroidery and linens. The meetings of the general assembly are conducted in the open square of the town, where the representatives meet armed. Appenzell possesses mineral springs and baths.

AP'PIA VIA or **AP'PIAN WAY**, the oldest and most celebrated road in Italy, and indeed in the whole world. It was first laid down as far as Capua by Appian Claudius, who afterwards, in his censorship (B.C. 312), from the loss of his sight, was called Cæcus. At a later period it was continued as far as Brundisium, making its total length 350 miles. It was completed before 30 B.C. A branch of it, called Via Domitiana, followed the then shore of the Bay of Naples, passing, therefore, through the fate of Herculæum and Pompeii, where it is still to be seen. It was called the queen of roads, and deserved the title, for it remained in good repair even after the conquest of Italy by the barbarians, and the consequent neglect it experienced; and it is still distinctly to be traced in most parts. The road was built of squared stones, closely fitted together without cement or iron, of various sizes, from 1 to 5 feet. There are two strata beneath: the first of rough stones cemented with mortar, the second of gravel, the whole being about 3 feet in depth. The breadth of the road is about 14 feet, excluding the footpaths, so as to admit two carriages. Part of the road between Rome and Terracina passed through the Pontine Marshes.

APPIAN (Appianus), the author of a Roman history in Greek, was a native of Alexandria, and lived at Rome during the reigns of Trajan, Hadrian, and Antoninus Pius. He practised as an advocate, and was employed as a procurator of the Cæsars. His history treats of the several parts or provinces of the Roman empire separately; he takes them up in succession, as they become connected with Roman history, and then gives an account of their relations with Rome, commencing with the old Italian tribes, and ending with the people of Illyria and the Arabians. To make his work complete he also gives a preliminary view of Rome under the kings, devotes one book to the wars of Hannibal, and at least five to the civil wars of Rome. Of the twenty-two books of his history only eleven are now extant, together with a few fragments of the others. Appian was well acquainted with Roman affairs and the Latin tongue, and seems to have compiled his facts with considerable care and industry, though he makes gross blunders with regard to the geography of the empire. His account of the civil wars, of which five books remain, is of considerable value; it begins with the agrarian agitation of the Gracchi, B.C. 133, and is continued to the death of Sextus Pompey, B.C. 35.

An excellent edition, which included a collection of extracts from the lost books, with a Latin translation and valuable notes, was published by Schweighäuser (Leipzig, 1875), in three vols. 8vo. A still more complete edition is that in the "Bibliothèque Grecque" of Firmin Didot, Paris,

APPIANI, ANDRE'A, probably the best fresco painter of the eighteenth century, was born at Milan in 1754. After visiting and studying in the principal cities of Italy, he chose Correggio for his model. From 1795 until 1813 he worked with great success at Milan; but in the latter year he was compelled to desist from his labours by a stroke of apoplexy, a second attack of which caused his death on 8th November, 1817.

Appiani was Napoleon's principal painter in Italy, for which office he received an annual pension of 6000 francs. He was a knight of the Iron Crown and a member of the Legion of Honour. He, however, died in poverty, having lost his pension in consequence of the Restoration in 1814.

His principal frescoes are in the church of Santa Maria Vergine, and in the royal palace of Milan; the latter have been engraved by Rosaspina. He was also an excellent painter in oils. There is a portrait of Napoleon by him, which has been engraved by Bartolozzi.

(Lamberti, "Descrizione dei Dipinti a buon Fresco eseguiti dal S. A. Appiani," Milan, 1809; Lanzi, "Storia Pittorica," &c.)

APPIANI, FRANCESCO, a distinguished fresco painter of the eighteenth century, was born at Ancona in 1702. He was employed by Benedict XIII. at Rome, but he lived chiefly at Perugia, where he continued to paint until his ninetieth year and his death in 1792—a degree of vigour, except in the cases of Spinello Aretino and Titian, perhaps without a parallel. He painted, according to Lanzi, many pictures for England.

APPIUS CLAUDIUS, The Claudian *gens* (or clan) of ancient Rome was one of the greatest of the patrician clans. The Claudii were Sabines by origin, and came to Rome *n.c.* 504, immediately being enrolled amongst the patricians. They were noted for their pride and haughtiness, their disdain of the laws, and their hatred of the plebeians; and in none of them were these characteristics more apparent than in several who bore the nomen Appius, a name much in favour with the Claudii.

1. The founder of the *gens*, Appius Claudius the Sabine, behaved so haughtily to the down-trodden plebs that his conduct when consul was the chief cause of the secession of the entire community to the Mons Sacer, *n.c.* 494, a step which shook Rome to her foundations. The concessions wrung from the patricians before the plebs would return led, however, to the basis of Rome's greatness.

2. The next Appius Claudius, son of the first, treated his soldiers with such severity that they deserted him, facing all the consequent penalties rather than continue under such a tyrant.

3. His son, the celebrated decemvir, was the cause of yet deeper woes to the republic. It was he who, having cast his first eyes on the maiden VIRGINIA, endeavoured to obtain her by falsely plunging her a slave. Her father, Virginius, a brave centurion, fetched from the army to plead his daughter's cause, seeing all hope was gone, himself stabbed Virginia in the forum, and holding the bloody dagger high, rushed from the city to his fellow-soldiers. Day after day marched on Rome, overthrew the government of the ten *decemviri* who had usurped executive powers, although appointed merely for special legislative purposes, and restored the ancient republican magistracy, *n.c.* 494. Appius Claudius was impeached by Virginius, but died in prison before trial, most probably by his own hand.

4. Appius Claudius Cæcus (the Blind), the Censor, had the credit of what we should call a commissioner of works in virtue of his office, which was the most dignified in the republic, but he went much beyond the numbering and classing of the people to which the significance of census is now limited. He was unsuccessful in his vast projects that he held every three years, and he was also twice

consul, and by his personal authority caused the rejection of the disgraceful terms of peace offered *n.c.* 280 by the invading Pyrrhus, king of Epirus, in that war of Rome with Tarentum which led to the memorable life and death struggle with Carthage for the empire of the world. He is the oldest Latin author whose works have come down to us; and, indeed, is every way one of the foremost figures of the republic, the indomitable energy of his race being fortunately more often turned to overthrowing the difficulties of nature than employed against his fellow-countrymen. Thus from him we get the "queen of roads," the celebrated APPIAN WAY; and by him too was begun the first aqueduct, the Aqua Appia (the Appian Water), in *n.c.* 313. No trace of the Aqua Appia now remains. It differed from its successors, the long lines of which make the Campagna of Rome picturesque with ruined arches; for the Aqua Appia was constructed when an enemy at the walls of Rome was no uncommon sight, and when, therefore, visible constructions would have been overthrown. The great censor, therefore, kept the "water" underground till it had entered the city, when a few arches took it across the low ground between the Cælian and Aventine hills to near the Forum Boarium, the low-lying ground along the banks of the Tiber, where dwelt the poor folk, for whose favour Appius was bidding; for although his aqueduct was so great a public benefit, and was especially for the good of the poor, Appius Claudius Cæcus had, without doubt, political ends in view, and used his high office in the most arbitrary way for the elevation of his own class. In fact, such extraordinary measures did he adopt for reclassing the citizens, so as to call up into the senate numbers of persons devoted to his interests who had no claim to the dignity, and to give power to the class of freed men at Rome (who from their venality were dangerous to the state, as they were always easy to be secured as voters by wealthy and unscrupulous men, such as the Claudii), that the next succeeding censors found it necessary to undo his work, and great mischiefs were thereby prevented. With the hereditary hatred of his gens against the plebs, the bone and sinew of Rome, Appius had thought to outvote them with the rascally mob of freed slaves whom he for a time enfranchised.

There are many other Romans of this name of more or less account in the annals of the republic; but we need only call attention here to one more—

5. Appius Claudius Pulcher, often called *Clodius*, the name by this time having become altered in its spelling. He served with distinction in Asia at the close of the republic, *n.c.* 70, under his brother-in-law Lucullus, and filled all the great offices of the state, using his power when censor to expel many of Cæsar's friends from the senate upon revising the lists. He warmly espoused the cause of Pompey the Great, and died in Greece *n.c.* 48, in the campaign which ended at Pharsalia so disastrously for his mighty chief. Appius Claudius Pulcher, when he was angry, wrote the standard work on the discipline of the augurs, and dedicated it to Cicero. The work was highly thought of, and it is to be regretted that it has perished, since its author's legal and antiquarian knowledge was unrivalled at the time. His brother, the notorious Publius Claudius Pulcher (the enemy of Cicero), we shall notice under Cicerone's, the name by which he is best known.

APPLE (*Pyrus Malus*). This fruit, which, from its hardness and great abundance, combined with its excellent flavour, is one of the most important productions of cold climates, is in its wild state the austere crab-apple of the hedges. At what period it first began to acquire from cultivation the sweetness and other qualities which are peculiar to it in its domesticated state, or by what accident the tendency to amelioration was first given it, we have no means of ascertaining. All that we know is that the apple

is spoken of by Homer as being one of the fruit trees cultivated in the gardens of Alcinoüs and of Laertes, that it was a favourite fruit of the Romans, who had many varieties, and that it has never ceased to be an object of great interest with all northern nations.

In procuring improved varieties of the apple, no other mode which leads to certain results has been discovered than that of cross-fertilization, but at the same time the following circumstances ought to be kept in view—1, the seed from which the new variety is to be obtained should be fully formed; and 2, it should be taken from as perfect a specimen as it may be practicable to procure, for it has been found by experience that any debility or defect in the parent is, in fruit trees, very apt to be communicated to their offspring.

England is celebrated for the excellence of its cider, a beverage which acquires its highest degree of excellence in Devonshire, Somersetshire, Worcestershire, and Herefordshire. See CIDER.

For the kitchen the apple is certainly of all fruits the most useful; and perhaps it is here that its utility to man is most conspicuous, because it proves when cooked a nutritious and wholesome food. The following analysis of the apple is given by Professor Church:—

	In 100 parts.	In 1 lb oz. gr.
Water,	83.0 ...	13 122
Albumen,	0.1 ...	0 28
Sugar,	6.8 ...	1 39
Malic acid,	1.0 ...	0 70
Pectose, pectin, and gum,	5.2 ...	0 364
Cellulose,	3.2 ...	0 224
Mineral matter,	0.1 ...	0 28

There is also present "a small quantity of a fragrant essential oil." For one part of nitrogenous constituents in the apple there are twenty of starchy (amylid) constituents.

In every district there is an abundance of local varieties, which are considered by their cultivators as of peculiar excellence. The following is a list of those kinds which have been proved the best by experienced cultivators in different parts of the country, together with the time during which they are in use:—Alfriston, November to February; Brabant Bellefleur, November to January; Blenheim Orange, October to February; Keswick Codlin, beginning of August; Dutch Codlin, September to November; Dutch Mignonne, December to February; Dunelov's Seedling, November to March; Collini, September to November; Tower of Glamis (a very excellent variety), October to November. Of dessert apples the varieties are endless, but the following is a list of such as can be recommended:—Cox's Orange Pippin, December to January; Court of Wick Pippin, December to February; Court-pendu Plat, December to March; Devonshire Quarrenden, September; Golden Harvey, December to March; Irish Peach Apple, August; Kerry Pippin, September to October; Sturmer Pippin ("this is one of the best, if not the very best, late dessert apples; it neither loses its briskness nor shrivels; the flesh is crisp, exceedingly sweet and juicy, and these qualities it may possess till May or even June").

Apples delight in a soft hazel loam, containing a small portion of sand. Deep soils are not necessary, but rather the reverse; a dry bottom is, however, indispensable; 18 or 20 inches of good soil upon a dry substratum, such as chalk or rotten rock, is enough; the same upon a gravelly bottom is, however, to be regarded as the minimum depth, for the roots of fruit trees should never be allowed to penetrate such a subsoil. To guard against this it is necessary to pave the bottom of the border, for a considerable distance round where the tree is planted, with stones, slates, flags,

tiles, or a composition floor of cement, to prevent the roots from penetrating beneath.

In *pruning* the apple tree, as indeed in all similar cases, three objects are chiefly kept in view—the first of which is to remove superfluous shoots; the second is to admit light and air to all parts equally; and the third is to check exuberance, and thus to promote fruitfulness.

Apple trees are trained in the form either of standards, dwarfs, espaliers, or balloons. No particular care is requisite in the management of *standards* beyond providing them with a straight stem 6 feet high, and a head consisting of three or four healthy shoots to commence with; and afterwards keeping the branches so pruned that they do not chafe against each other in windy weather, nor overshadow each other; all the rest is generally provided for sufficiently by nature herself. They are principally employed in planting orchards, as they cast too great a shade to be admitted into good gardens.

For garden purposes *dwarf* apple trees are so far superior to all others that they are now almost exclusively planted. Independently of the little space they occupy, the small degree in which they overshadow the soil, and the great facility they offer for gathering their fruit, they are generally so much beyond the influence of high winds as to have but little of their crop blown down by autumnal gales, and their fruit is also finer than on standards.

Espalier apple trees are much used, but they are in all respects so inferior to dwarfs, and so much more expensive to keep in good order, that we omit all further notice of them.

Many different methods of *preserving* apples have been recommended, and almost every one has some favourite plan of his own. As far as our experience goes, the best mode is to allow the fruits, after being gathered, to lie till their superfluous moisture has evaporated, which is what is technically called "sweating;" the apples should then be wiped quite dry, wrapped in tissue paper, and stowed away in jars or chests of pure silver sand which has been previously dried in an oven. They should always be taken out of the sand a few days before they are wanted, and laid in dry fern or some such substance; they then absorb oxygen, and acquire a little sweetness, which is necessary to their perfection.

The apple is propagated either by *bedding* or *grafting*; the former practice is preferable for standards, the latter for dwarfs. The stocks that are employed are the wild crab, the doucin or English paradise, and the French paradise apple. The former should be used for standards only, as it imparts too much vigour to the scions to render them manageable as dwarfs; the French paradise should always be employed for the latter, as it has the property of stunting the shoots and rendering them much more fertile. The doucin or English paradise stock, which is what the English nurserymen usually sell as *the paradise stock*, is intermediate in its effect between the crab and the French paradise, being less vigorous than the first and more so than the last. When there is no wish to confine the dwarf trees within a very narrow compass, this kind of stock, which is harder than the French paradise, is the proper one to employ; but if the dwarfest trees that can be procured are the objects of the cultivator, then the latter only should be planted. See BRIDGING, GRATINGS.

It is only necessary to add that the proper season for planting the apple is in October or November, as soon as the leaves are dead or discoloured and beginning to drop. Vegetation at that season is not altogether torpid, but goes on just enough to enable the plants to send out a few rootlets before winter, and to thus take advantage of the first period of growth in the succeeding spring.

APPLEBY, a market town and parish in Westmoreland, of which it is the capital, 276 miles by rail

from London, and 31 S.E. of Carlisle. It is situated on the river Eden, which falls into the Solway Frith, and is crossed by an ancient stone bridge. It is built principally on the slope of a hill, and consists chiefly of one street, with the castle at the upper end. The town contains two parishes, St. Lawrence on the left bank of the river, and St. Michael on the right, each of which forms a separate vicarage. The principal buildings are—the two parish churches, and other places of worship; the market house, which was rebuilt in the Gothic style in 1811; the town-hall; the shire-hall; an almshouse; and a grammar school. The town was at one time much larger than at present, and there are many evidences of its ancient importance. It was burned by the Scots in the reign of Henry II., and again in that of Richard II. The castle, the keep of which is in good preservation and bears the name of Caesar's tower, though it is not of Roman origin, made a most heroic defence against Cromwell, under the famous Countess of Pembroke, who was a great benefactress to the town. The population of Appleby in 1881 was 2899.

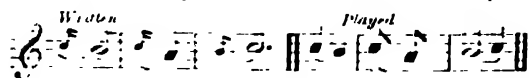
The borough returned two members to Parliament to the time of the Reform Bill of 1832, when it was disfranchised.

APPLE-SHELL (*Ampullaria*) is a GASTROPOD, and a near relation of the *RIVIER-SNAIL* (*Paludina*). The shell is globular, with a small spire and a large inflated body-whorl; the rounded mouth (*APERTURE*) has a continuous unnotched margin, and is closed by a concentric lid or operculum. The small inhabitants lakes and rivers in South America, the West Indies, Africa, and India. It is one of those which, during the dry summer weather, bury themselves in the mud, and are capable of existing for long periods without water; e.g. many apple-shells have been found alive in logs of mahogany which have been brought from Honduras. As this is one of the plant-eating snails (*Holostomatæ*), there are no true siphons for the passage in and out of water to the gills, but the left "neck-lappet" is curled up to serve as an incumbent siphon. The tentacles are very long and slender, and the eyes are placed on short stalks outside the tentacles. The Indian species lay globular pale green eggs about the size of small peas, which are placed in clusters on sticks and other things in the ditches; the eggs when dry form most beautiful objects. Some of the African species are reversed, or have the whorls of the shell turned from the right to the left, and these have been separated into a genus, under the name of *Lanistes*, on this account. The large Egyptian species, *Ampullaria acuta*, discovered by Olivier in Egypt, lives in Lake Mareotis, where the water is salt; and *Ampullaria* have also been found in abundance at the mouth of the Indus, mixed with marine shells.

APPOGGIATURA or Grace-note, in music, an ornament or grace consisting of an extra note inserted before that principal note of the melody which it graces. The grace-note is most usually in smaller-sized type. An appoggiatura takes from the time of the principal note, and is by many careful composers now written the length it is really to be played, though still in a smaller-sized character. It is now becoming almost universal to write the grace passage in full notes. The old way of writing it was as a quarter, eighth, &c.

A broadly appoggiatura means *leaning note*, and in performance is played, however written, as half the length of the principal note; or if the latter is dotted the appoggiatura takes two-thirds the entire length.

We subjoin examples of the older method of writing.



For such a note is sometimes called the "short appoggiatura."

(which does *not* take from the time of the principal note) see ACCIACATURA.

APPORTIONMENT. Apportionment is a term of law which signifies the dividing of a rent, annuity, or other payment that is made at fixed intervals. The apportionment may be either among several persons entitled to the rent, or between the person entitled to the rent and the person or persons liable to the payment of it. The apportionment is generally pursuant to a positive rule of law.

A rent reserved out of land may be apportioned by granting the reversion of part of the land out of which the rent is reserved, or by granting part of the rent to one person and part to another. When rent is reserved upon a lease, and the lessor disposes of part of the lands in reversion, either by will or deed, the rent is apportionable, provided the lessee concur.

If land is let on lease with a rent reserved, as in a building lease, the lessor has a right of distress on all the land; and if the land is sublet in smaller portions each lessee is liable to be distrained on for any rent which may be due on the whole land, unless, as is generally the case, the original lessor agrees that the rent shall be apportioned on the several portions which are sublet.

If a man having a rent-charge on lands purchases any part of them, the rent-charge is extinct as to the whole; but if part of the land out of which the rent issues descends upon the owner of the rent-charge, the rent will be apportioned. If a grantee of a rent-charge release all his right in part of the land charged, he extinguishes the whole rent; but if a grantee of a rent-charge release part of the rent to the grantor, the residue will remain charged on the land. A difficulty thus arises on the sale of part of lands subject to a rent-charge. If the party entitled to the rent is willing to release the land to be sold, the owner of the rent charge sometimes assigns it to a trustee upon trust, to receive it exclusively out of the lands intended to remain charged. Another mode is for the annuitant to join in the conveyance of the lands sold, and to add a proviso that the other lands shall continue liable. This plan, however, is open to the objection, that as the proviso operates as a new grant the rent-charge becomes liable to the incumbrances of the owner of the land created before the conveyance. A third mode is for the owner of the rent-charge to covenant not to distrain on the lands sold; but it seems doubtful whether such a covenant does not operate as a release of the rent-charge. If the owner of the rent-charge will not concur, the only plan seems to be for the vendor to covenant with the purchaser that the lands not sold shall be exclusively liable, and give an indemnity against the rent-charge.

By the common law, if a lessor who was tenant for life died within the half-year at the end of which rent was due upon a lease which determined on the death of the tenant for life, his personal representatives could not claim an apportionment of the rent, nor could the remainder-man or reversioner claim that portion which accrued during the life of the tenant for life.

It was, however, enacted by the statute 11 Geo. II. c. 19, s. 15, that where a lessor tenant for life died before the rent day his executors might recover from the tenant a proportionate part of the rent. But this statute did not provide for all the cases that arose, and accordingly the 1 & 5 Wm. IV. c. 22 was enacted, the chief object of which was to apply the principle of equitable apportionment to all periodical and fixed money payments between the personal representatives of a deceased person who was entitled to the land, and the person who was entitled to it after his death. This Act has, however, no application to annual sums payable by any policy of assurance, nor to any case in which a stipulation has been made that no apportionment shall take place.

This Act was not understood to apply to Scotland till 1814, when it was decided by the Court of Session that it did so apply, and the judgment was affirmed by the House of Lords. In consequence of the Act being expressed exclusively in the technical phraseology of the law of England, it has given much trouble to Scotch lawyers and difficulty in the Scotch courts, whose systems and terms are so very different.

Rights of common are apportionable in certain cases. Common of pasture where it is appendant may be apportioned, either where the commoner purchases a part of the land in which he has the right of common, or upon an alienation of part of the land to which the right is appendant. In the case of common of pasture appurtenant there will be apportionment in the second case, but not in the first.

APPRAISEMENT (from the French *apprécier*, *appriser*, or *appraiser*, and remotely from the Latin *pretium*, to set a price upon an article). When goods have been taken under a distress for rent it is necessary, in order to enable the landlord to sell them according to the provisions of the statute 2 Wm. and Mary, sess. i. c. 5, that they should be previously appraised or valued by two appraisers. These appraisers are sworn by the sheriff, under-sheriff, or constable to appraise the goods truly according to the best of their understanding. After such an appraisement has been made the landlord may proceed to sell the goods. The term is also generally used with reference to any act of valuation made by an appraiser.

Appraisements are subject to the following scale of duties. Where the amount of appraisement does not exceed £50 the duty is 2s. 6d., and where it exceeds

£50, and does not exceed £100,	5s.
100, do. do. 200,	10s.
200, do. do. 500,	15s.
500,	£1.

The corresponding term in Scotch law is *appréciation*, or the valuing of distrained or *pounded* goods. In former times this was required to be twice performed by different appraisers, the first time at the place where the distraint took place, and the second at the market cross of the chief county town. By the Act 54 Geo. III. c. 137, s. 4, the process was simplified, and one appraisement, where the goods are, is now sufficient.

APPRAISERS (French, *appréciateurs*) are persons employed to value property. By the statute 46 Geo. III. c. 43, it was first required that any person exercising the calling of an appraiser should annually take out a license to act as such, stating his name and place of abode, and signed by two commissioners of stamps. By the same statute a stamp duty of 6s. was imposed upon such licenses, and unlicensed persons were forbidden to act as appraisers under a penalty of £50. The duty now imposed is £2.

APPREHEND. To apprehend, in law, is to arrest a criminal or debtor in order to commit him to prison. The warrant of a judge is usually required for the legal justification of apprehension; but in the case of felony, and more especially in that of treason-felony, extensive powers of arrest without warrant are given by the law both to peace-officers and to private individuals. Not only so, but the law enforces the duty of arrest upon all persons who are present and see a felony committed, or attempted to be committed, under penalty of fine and imprisonment. Any private individual may justify an arrest for felony, without warrant, if he can show either that a felony was in fact committed by the party arrested, or that a felony was committed by some one, and that he had probable cause, from his own observation or the credible information of another, to suspect the person arrested of being the felon. If these facts can be established the arrest, in order to bring the accused or suspected person before a magistrate, and his

detention until the question of his guilt or innocence is decided, are lawful, even though in the result he should not be found guilty. To further encourage the apprehension of offenders by private persons, in the interests of order and justice, it was provided by the 7 Geo. IV. c. 61, s. 28 (further amended and extended by the 14 & 15 Viet. c. 55), that any court of oyer and terminer, gaol delivery, superior criminal court of a county palatine, or any court of sessions of the peace, should have power to order, through the sheriff of the county, the payment of a reasonable and sufficient compensation to any person who had been active in the arrest of any criminal. Provision is also made by the above statutes for compensation to the families of those who lose their lives in the attempt to arrest persons charged with criminal offences. It must be observed, however, that no private person may arrest *on suspicion merely*, and also that any infringement of legal liberty that cannot be justified in the manner referred to gives a valid ground of action against the offender.

The powers of arrest intrusted to constables and officers of the law are of necessity more extensive than those of private individuals. As a constable must constantly act upon the charge and information of others in arresting criminals, who might escape altogether unless promptly captured, he is protected by the law, wherever he has reasonable and probable cause to suspect any person, even from the information of another, of having committed a felony. For the same reason he has power to break open a door when in pursuit of a criminal, or to execute a warrant; but in the latter case he must first declare his business, demand admission, and allow a reasonable time for opening. On a complaint being made to a constable that a felony has been committed, or a dangerous wound inflicted, he is bound to take the offender into custody, or to receive him from others who have taken him.

The wilful obstruction or prevention of any lawful arrest is regarded as an offence of a very serious nature, and is punishable by fine or by imprisonment (with or without hard labour) for any term not exceeding two years. But if the obstruction is accompanied by any aggravating circumstances, such as the use of firearms, cutting or stabbing weapons, &c., the offence is punishable by penal servitude for life, and if the officer or any one assisting him be killed the crime is murder.

When a person is apprehended upon probable suspicion of treason, treason-felony, or felony, though there be no warrant, and even though he be innocent, he is not justified in resisting; he must submit to be taken into custody and to an investigation of his case before a magistrate, and if committed, to the trial and judgment of the law.

The warrant of any judge in the United Kingdom is effective throughout the whole of the kingdom, the only formality necessary being that in the case of an English warrant to be executed in Scotland or Ireland, and *vice versa*, the warrant must be endorsed by a judge of the country in which it is to be enforced. The offender, when arrested, may be lodged in gaol until he can be sent back to the place where the offence was committed. Thus a prisoner may be arrested in Scotland for an offence committed in Ireland, brought to England, and sent to Ireland to be tried. And if a felony be committed out of the queen's dominions, whether on sea or land, the felon may be arrested in England. Conventions have also now been entered into between the British government and most foreign civilized states for the apprehension of fugitive criminals, with the exception of persons guilty of political offences merely. Where the crime is of a complicated character the condition of surrender always is, that when the prisoner is taken back to his own country he shall not be tried for a political offence.

APPRENTICE (from the French *apprenti*, which is

from the verb *apprendre*, to learn) signifies a person who is bound by indenture to serve a master for a certain term, and receives, in return for his services, instruction in his master's profession, art, or occupation. In addition to this, the master is often bound to provide food and clothing for the apprentice, and sometimes to pay him small wages; but the master often receives a premium.

The system of apprenticeship in modern Europe is said to have grown up with that of associating and incorporating handicraft trades in the twelfth century. These corporations, it is said, were formed for the purpose of resisting the oppression of the feudal lords, and the union of artisans in various bodies must have enabled them to act with more effect. The restraint of free competition, the maintenance of peculiar privileges, and the limitation of the numbers of such as should participate in them, were the main results to which these institutions tended. To exercise a trade it was necessary to be free of the company or fraternity of that trade; and as the principal if not the only mode of acquiring this freedom in early times was by serving an apprenticeship to a member of the body, it became easy to limit the numbers admitted to this privilege, either indirectly by the length of apprenticeship required, or more immediately by limiting the number of apprentices to be taken by each master. In agriculture apprenticeship, though in some comparatively later instances encouraged by positive laws, has never prevailed to any great extent.

Since the twelfth century apprenticeship has prevailed in almost every part of Europe—in France, Germany, Italy, and Spain, and probably in other countries. It is asserted by Adam Smith that seven years seem once to have been all over Europe the usual term for the duration of apprenticeships in most trades. There seems, however, to have been no settled rule on this subject, for there is abundant evidence that the custom in this respect varied even in different incorporated trades in the same town.

Neither in Ireland nor in Scotland have the laws relating to associated trades or apprentices been very rigorously enforced. In Ireland the same system of guilds and companies certainly existed, but as it was the policy of the English government to encourage settlers there little attention was paid to their exclusive privileges; and in 1672 the lord lieutenant and council, under authority of an Act of Parliament, issued a set of rules and regulations for all the walled towns in Ireland, by which any foreigner was allowed to become free of the guilds and fraternities of tradesmen on payment of a fine of 20s. A statute containing very similar enactments was passed in 19 Geo. III. The term of apprenticeship also in Ireland was of a moderate length, five years being required by 2 Anne, c. 4, for the linen manufacture, which by 19 Geo. I. c. 2, was reduced to four years. It is asserted by Adam Smith that there is no country in Europe in which corporation laws have been so little oppressive as in Scotland. Three, five, and seven years are there common terms of apprenticeship; but the custom varies considerably in different communities.

In England the institution of apprenticeship is of very old date, being probably contemporaneous with the formation of the guilds or companies of tradesmen. In the statutes of the realm, however, there is no reference to such an institution for about 200 years after the guilds are known to have existed, apprentices being first incidentally noticed in an Act (12 Rich. II. c. 3) passed in 1388. In the Act 8 Henry VI. c. 11, the putting and taking of apprentices are stated to have been at that time a custom of London then out of mind. A statute (5 Eliz. c. 4) fixed the term of apprenticeship at seven years, and contained numerous provisions. This statute was repealed in 1814 by 54 Geo. III. c. 96.

The above laws were enacted at a time when the impolicy of such legislation was not perceived. But opinion

gradually became opposed to these enactments, and the judges interpreted the law favourably to freedom of trade. Accordingly the decisions of the courts tended rather to confine than to extend the effect of the statute of Elizabeth, and thus the operation of it was limited to market towns, and to those crafts, mysteries, and occupations which were in existence at the time it was passed. And although, in consequence of this doctrine, many absurd decisions were made, yet the exclusion of some manufactures, and particularly of the principal ones of Manchester and Birmingham, from the operation of the Act, had probably a favourable effect in causing it to be less strictly enforced even against those who were held to be liable to it. It was proved before a committee of the House of Commons, in 1814, that the provisions of the statute of Elizabeth neither were nor could be carried into effect in our improved state of trade and manufactures. The result of the inquiry and of a petition was the Act 54 Geo. III. c. 96, by which the section of that statute which enacts that no person shall exercise any art, mystery, or manual occupation without having served a seven years' apprenticeship to it, was wholly repealed, with, however, a reservation in favour of the customs and by-laws of the city of London and of other cities, and of corporations and companies lawfully constituted.

Apprenticeship, though no longer legally necessary (except in a few cases), still continues to be the usual mode of learning a trade or art, and contracts of apprenticeship are very general. The 7 & 8 Vict. c. 112, s. 32, enacts that overseers of the poor for any district, union, parish, township, or place in the United Kingdom, may put out as an apprentice in the British merchant sea service any boy who is twelve years of age and of sufficient health and strength, with his consent, who, or his parent or parents, is or are chargeable to or maintained by such district, &c., or who shall beg for alms therein. The apprenticeship is to last till such boy attain the age of twenty-one years, or shall have served seven years as an apprentice, whichever shall first happen. Section 141 of the Merchant Shipping Act provides that all shipping masters appointed under it shall give to any board of guardians, overseers, or other persons desirous of apprenticing boys to the sea service, and to masters and owners of ships requiring such apprentices, such assistance as is in their power for facilitating such apprenticeships; and may receive from persons availing themselves of such assistance such fees as may be determined on.

To constitute an apprenticeship it is necessary that regular indentures be formally executed, a mere agreement being insufficient. The full sum or sums of money received, given, paid, or contracted for must be truly inserted, or the indentures may be declared void.

An indenture is determinable by the consent of all the parties to it. It is also determined by the death of the master. But the executor may transfer the apprentice to another master for the remainder of his term; and if there is any covenant for maintenance the executor is bound to discharge this as far as he has assets. By the custom of London, if the master of an apprentice die, the service must be continued with the widow, if she continue to carry on the trade. In other cases it is incumbent on the executor to put the apprentice to another master of the same trade.

The object recognized in apprenticeship being that the apprentice shall have full instruction in the practice of his art, craft, or trade, it is required of the master that such instruction as is necessary for the attainment of this shall be given. The master is not bound, however, to the literal instruction of the apprentice by himself personally, but may avail himself of the assistance of journeymen or other workmen serving in his place of business, or even of other apprentices in the same trade.

As the master is recognized by the law to sustain in some degree the office of parent or guardian, he would probably be justified in the infliction of moderate chastisement, but he cannot discharge an apprentice. If he has any complaint against him, or the apprentice against his master, on application of either party to the sessions, by 5 Eliz. c. 4, or to two justices in the case of a parish apprentice, by 20 George II. c. 19, and other acts, a power is given to punish or to discharge the apprentice, and in some cases to fine the master. If any apprentice whose premium does not exceed £10 run away from his master he may be compelled (6 Geo. III. c. 25) to serve beyond his term for the time which he absented himself, or make suitable satisfaction, or be imprisoned for three months. By the custom of the city of London, a freeman may turn away an apprentice for gaming, and by Scotch law an apprentice who proves incorrigible may be discharged.

APPROACHES. This term is applied to the covered roads which are made by a besieging army from the depots of materials sometimes to the foot of the breach in the ramparts of the fortress. They are mostly in zigzag or oblique directions, crossing and recrossing the prolonged capitals of the works attacked in order that they may not be entailed by the defenders; and they consist generally of trenches excavated in the ground, the earth being thrown towards the fortress in order to protect the men in them from the direct fire. Occasionally, as on rocky or marshy ground, they consist merely of covering masses formed of earth brought to the spot in bags, stuffed gabions, wool-packs, or any other bulky objects which can be obtained.

APPROBATE and **REPROBATE.** This is a technical term used in Scotch law to signify that one takes advantage of one part of a deed, and refuses to be bound by the remainder. This is not permitted by the law, and the rule is obviously founded upon justice and reason. It would be manifestly unfair to allow any one to take benefit under the provisions of a will, or any other legal deed, while at the same time he refused to give effect to its provisions for the benefit of another. Thus, if a testator should give an estate to one person by will, and at the same time bequeath to another the estate which otherwise would have been the property of the first, the law would not permit the first person to take the estate bequeathed him, and at the same time to refuse to comply with the condition as to the disposal of the other. The exceptions to this rule are where the conditions are either frivolous in themselves or are opposed to the general interest. There is an analogous doctrine in the law of England, where it is called election.

APPROPRIATION. See ADVOWSON, BENEFICE.

APPROPRIATION CLAUSE. This term was applied to a clause in the Irish Tithes Bill brought forward by Lord John Russell in 1835, by which any revenue that might accrue from the working of that Act should be apportioned for the education of all classes of the people. The clause was adopted by the Commons both in 1835 and 1836, but rejected on both occasions by the Lords.

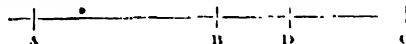
APPROVER, in English law, is the name given to an accessory to a crime who bears evidence against his accomplice. The admission of such evidence requires the previous sanction of the judges of gaol delivery, and leave from the judge presiding at the trial. The witness is usually spoken of as having become *queen's evidence*, and there is in such cases the implied promise of a free pardon on condition that full confession is made. Should the witness equivocate he forfeits this claim, and his confession may be used against himself. In Scotch law an approver is termed a *socius criminis*, and it is an established principle of that law that the act of putting such a witness in the box saves him from all prosecution in connection with the matter labelled, so that he may give his testimony

freely and fairly, being under a feeling of security as regards himself.

APPROXIMATION, from the Latin, signifies a *drawing near to*. In mathematics, results are said to be found by approximation, when the process employed gives nearly, but not exactly, the result required.

Strictly speaking, the observed phenomena in every branch of experimental philosophy are approximations, more or less near, to the truth. Thus the distance of the sun, or the diameter of a planet, are only known approximately; but general custom does not sanction the application of the term to any "drawing near" in which the imperfection arises from error of the senses, or of instruments. It is only when the defects of mathematical analysis oblige us to be content with a formula which gives results only near true that the latter are said to be approximate. To this part of the subject, then, we confine ourselves.

It may be stated as a general fact that there are very few mathematical processes which give absolutely correct determinations, in which the answer obtained is neither more nor less than is necessary to satisfy the conditions of the question. But the fault is not in the processes themselves, but in the problems which it is necessary to submit to them, and in the nature of arithmetical, as distinguished from geometrical, magnitude. It is worth while briefly to elucidate this point. In geometry the mind conceives one line or angle to differ from another by some magnitude of the same kind which can be assigned, and a magnitude is rather imagined to be given than actually given. If we attempt to construct the line or angle of geometry, we must have recourse to approximation, and that of the roughest character, since the errors are as great as those of the senses. It is only by laying down the postulate that any line or angle can be assigned independently of all mechanical methods, that geometry becomes, mentally, a science of absolute exactness. In arithmetic, on the contrary, the very first notion of numbers throws a theoretical difficulty in the way. We can imagine a line to grow or increase *continuously*, that is, in such a way that it shall not increase from 1 to 2 feet without previously assuming every possible length which lies between 1 and 2 feet. This idea is forced upon us whenever we see points moving to or from each other. But is it therefore true that every possible length which is greater than 1 foot and less than 2 can be expressed by 1 foot and some determinate numerical fraction of a foot? This question reduces itself to the following. Let AB be greater than AC (1 foot).



and less than AC (2 feet); if BC be successively divided into two equal parts, three equal parts, four equal parts, and so on, *ad infinitum*, does it follow that some one or other of the subdivisions must of necessity fall upon the point D , previously taken at hazard? If we appealed to the evidence of the senses we should certainly answer in the affirmative, for, though the finest compasses were used, we should soon find some point of subdivision so near to D as not to be distinguishable from it by the severest test our senses could apply. But our mechanical points are minute solids, while the mathematical point has neither length, breadth, nor thickness. Conceive the latter and the affirmative answer does not appear self-evident; for, though the continuation of the points of subdivision is unlimited, the number of points which can be taken in the line is also unlimited. And we can demonstrably answer the question in the negative [see INCOMMENSURABLE]; as an instance, either let BD be equal to the side of that square of which BC is the diagonal, or let BC be the circumference of that circle of which BD is the diameter. In

neither case can one of the subdivisions of n ever fall on n .

Here, then, is a fruitful source of the necessity of having recourse to approximation, since we cannot be sure that any required relation between concrete magnitudes is absolutely expressible in numbers. In fact, we may state the following as a result of experience, though not, so far as we know, capable of demonstration.—Numbers being taken at hazard, and submitted to any process which requires the solution of an equation higher than the first degree, the odds are greater than can be assigned against obtaining an absolute result without approximation. In a common table of logarithms, fixing at hazard upon any number, the odds are nearly seventeen thousand to one against choosing a number of which the logarithm can be exactly given.

This would appear to throw an air of uncertainty over almost all the conclusions of pure mathematics, and justly so, if it were not for the following truth, which, except so far as the labour of approximation is concerned, renders it practically immaterial whether a result be obtained exactly or by approximation. Any equation whatsoever which expresses the conditions of a possible problem, if not capable of exact solution, may yet be so far satisfied that a number or fraction can be found, which, on being tried in the given equation, shall produce an error smaller than any we may think it necessary to name at the outset. For instance, the ratio which the circumference of a circle bears to its diameter does not admit of an exact and absolute determination. If any two numbers be named, their ratio is either too great or too small. But supposing it asked to determine the circumference of a circle from its diameter so nearly that the error shall not be so much as a foot for every hundred miles of a circle. It can be shown to be more than sufficient for this purpose to multiply the diameter by 3.14 and divide by 113, which, if the diameter were 100 miles, would give 314 miles, 280 yards, and 1 foot: this, though too small, is within the conditions of the question, not being too small by 1 foot. Again, though it is impossible exactly to solve the equation $x^2=7$ or $x^2=7-0$, that is, to find a fraction which, multiplied by itself, shall make 7, yet naming any fraction, however small, at pleasure—for example, one millionth or $\frac{1}{1000000}$ —it is possible so to determine x , that $x^2=7$, though not absolutely *nothing*, shall be less than the proposed fraction, one-millionth.

APRICOT (*Prunus Armeniaca*) is cultivated commonly in this and other European countries. The old English form is *apricocke* (from Lat. *præcoqua*, early ripe). Like many other domesticated plants, the native country of the apricot tree is unknown. From the name it bore among the Romans, *Armeniaca*, it would appear to have been a native of Armenia, to which country it is in fact assigned by both Pliny and Columella.

As a domestic fruit tree in the climate of England, the apricot is a plant of less importance than many others; the early season at which it blossoms causes it to be peculiarly subject to the effect of spring frosts, so that a crop of its fruit is very precarious. It is, however, much cultivated.

Apricots in this country are produced either upon open standard trees or upon walls with a westerly aspect; an eastern exposure is extremely unfavourable to them, at least on the east side of the island. The fruit produced upon walls is the finest, but that from standards is by far the best-flavoured. Of the kinds that are cultivated upon walls there are only three that are much worth having, namely the Orange preserving, and the Moorpark and Turbott; the latter several others are to be met with in the same catalogue, but they are of little importance. The *moorpark*, which is grown upon standards, is by far the best preserving, and its kernels are sweet.

The rules for training the apricot are essentially the same as those for the peach. See PEACH.

APRIL, the fourth month of the year, consists of thirty days, which was the number said to be assigned to it by Romulus. Numa Pompilius deprived it of one day, which Julius Cæsar restored, and which it has ever since retained. In the original Alban or Latin Calendar April was the first month of the year, and had thirty-six days. Its name is usually considered to have been derived from *aperire*, to open—either from the opening of the buds or of the bosom of the earth in producing vegetation. The Anglo-Saxons called it *Oaster* or *Easter-monath*. In this month the sun travels through parts of the signs of Aries and Taurus, that is to say, of those parts of the ecliptic which astronomers designate by those names. The motion of the sun among the constellations themselves is through parts of Pisces and Aries; the discrepancy between the present position of the constellations and the past, the latter being indicated by the signs, is explained under ARIES. See also PRECESSION, ZODIAC.

APRIL CEREMONIES. The custom of making fools on the first of April is a practice well known in England, France, Sweden, and probably in other countries of Europe; and it is believed to be connected with an immemorial custom among the Hindus held near the same period in India, toward the end of March, called the Huli Festival, when mirth and festivity reign among the Hindus of every class, and people are sent upon errands and expeditions which end in disappointment, and raise a laugh at the expense of the person sent. ("Asiatic Researches," vol. ii, p. 331.) In England the first of April is usually termed "All Fools' Day," and the person imposed upon an "April fool." In France this person is called a "Poisson d'Avril," that is, a mackerel or silly fish; in Scotland "an April gowk." Maurice ("Indian Antiquities," vol. vi, p. 71) speaks of the Huli Festival as the celebration of the period of the vernal equinox.

A PRIORI and **A POSTERIORI** are two terms frequently used in theological and metaphysical speculation, and signify literally "from a thing before," and "from a thing after." The former name is given to that method or process of reasoning which rests upon general or universal notions or ideas, and the latter to the mode whereby the various facts of observation are gathered up and expressed by a single formula. Thus the argument which seeks to prove the existence of God from the general difficulties in the supposition of the existence of what we call creation or the universe on any other hypothesis is a *a priori* reasoning. This argument was first proposed by St. Anselm of Canterbury, who stated as a philosophical axiom that "the idea of God in the mind of man is the one unanswerable evidence of the existence of God;" and his reasoning upon this subject is famous as an example of the *a priori* method. In theology the arguments which are derived from what are considered marks of intelligent contrivance in the part of creation with which we are acquainted are termed *a posteriori*.

A leaning to one or to the other method forms one of the most important distinctions among the schools of philosophy. They are frequently termed the deductive and inductive modes of reasoning, and Plato and Aristotle may be taken as representatives of the former, and Bacon and Locke of the latter. German philosophy mostly inclines towards the *a priori* method, while the British school has leaned more towards the *a posteriori*. The followers of each system assert that it virtually includes the opposite; the advocates of a *a priori* reasoning claim for their conclusions the character of "necessary truths," which can only be confirmed by arguments of the other kind; while the opposite school maintain that the so-called "necessary ideas" are simply the results of experience,

and that all knowledge is derived by the method *a posteriori*.

The term *a priori* is frequently used in a sense which means "previous to any special examination;" as when a sentence begins with "*a priori* we should think," &c. &c., it generally means nothing more than the expression of the leaning to which the speaker found his mind inclined before he had investigated the proposition.

APSE or AP'SIS. The semicircular termination to parts of a cathedral or church, such as the choir or chancel. It corresponds to the semicircular recess in which was the tribunal in the ancient Roman Basilica. In the cathedrals of Italy, Germany, and France the apsidal termination is very general. Many examples are to be seen in England and Scotland. The cathedrals of Canterbury, Rochester, Norwich, and Peterborough, Ripon Minster, and Westminster Abbey have apsidal terminations.

AP'SHERON, a peninsula of Asia, in Georgia, forming the eastern boundary of the Caucasus range. It extends a distance of 40 miles into the Caspian Sea, and terminates in Cape Apsheeron. The soil is impregnated with salt, sulphur, and naphtha, and has long been held sacred by the fire-worshippers of Asia, in consequence of the flames which are continuously burning. The burning naphtha is sometimes seen floating on the surface of the sea for miles around, and occasionally the soil gives forth discharges known as "mud volcanoes." Madder and saffron are extensively cultivated.

APT, an ancient and pretty town of France, in the department of Vaucluse, is situated on the left bank of the Calavon, a tributary of the Durance, in a valley surrounded by hills and covered with vineyards and olive plantations. It is 30 miles E. of Avignon, and has a civil tribunal, a college, and 6000 inhabitants, who manufacture cotton and woollen stuffs, wax candles, confectionery, pottery, brandy, silk twist, and leather. There is a good trade in corn, silks, brandy, wine, black truffles, fruits, honey, and cattle. Apt is surrounded by ancient solidly-built walls, which were restored by the counts of Provence; the principal streets are wide, clean, adorned with fountains, and lined with good houses. The Gothic church, which is of great antiquity, and built over still more ancient crypts, is the most remarkable building. This church and the ancient cemetery have been classed among the historic monuments of France. Several Roman remains have been found in Apt, which is said to have existed before the Roman conquest; a Roman bridge (Pont Julien) over the Calavon is still perfect. Julius Cæsar, who, after destroying Apt, caused it to be rebuilt, gave it the name of *Apta Julia*. It suffered much from the Lombards and Saracens, but as stated the fortifications were restored.

APTERA (Gr. *a*, not, and *ptérā*, wings) is a name sometimes given to the group *amictabola*. It includes lice, bird-lice, and springtails.

APTERAL is a term formed from a Greek compound word signifying "not having a wing," or "without wings;" and in this sense it is applied to a temple which has prostyles or porticos of columns projecting from its fronts or ends, but is without lateral columns. Such columns running along the flanks from one end to the other, would make it "peripteral."

APTERYX (Gr. *a*, not, and *ptéryx*, a wing), a bird of New Zealand, named by the natives *kivi*. This genus, which is on the verge of extinction, presents a remarkable combination of characters. The whole osseous framework and the muscular development would alone suffice to show that the bird possessing them was more terrestrial than aerial—a runner upon the ground rather than a flier in the air. The scapular arch in the adult apteryx is scarcely more developed than the same part in the embryos of most other genera. It retains in a permanent ossified condition

the same phase of development which is temporary in the young chick or eagle. Combined with its inability to fly, there is associated another remarkable feature, in which it departs from the prevalent ornithic type, and approaches the more terrestrial vertebrates. That feature is the absence of air cells, whereby the bodies of most birds are rendered so specifically light, and the presence of marrow in all the hollow bones. In this last point it again exemplifies a permanent condition of a phase which is temporary in most birds whose bones are first filled with marrow, and by subsequent development become more or less permeated with air. The feathers also of the apteryx differ from those of birds of flight; they are loose and pendent; the barbules also are loose, and do not lock into one another so as to give that fineness which is characteristic of a bird's wing, and there are no accessory plumes. The wings are quite rudimentary, and are concealed by the long hair-like feathers. The bill is long and slender, with the nostrils placed at the tip. The habits are nocturnal. Its food consists of insects and worms, for which it searches by thrusting into the ground its long and sensitive bill. A rudimentary hind toe (hallux) exists, which is wanting in the allied genera. Only a foot or two high, it creeps about under the ferns, and does not walk upright, like its big relation the ostrich. There are four species, all natives of New Zealand—*Apteryx mantelli* and *Apteryx haastii* in the North Island, *Apteryx australis* and *Apteryx owenii* in the South Island. The order *STRUTHIONIS* or *Ratitæ*, to which this genus belongs, contains also the ostrich of Africa, the rheas of South America, the emu and cassowary of Australia, and the two extinct genera, *Moa* (*Dinornis*) of New Zealand, and *Epyornis* of Madagascar. These all agree in having no keel to the breast-bone, rudimentary wings, and the barbs of the feathers not connected with one another.

APULEIUS or APPULEIUS, a celebrated author and philosopher of antiquity, probably flourishing about the second century of our era. He was born in the Roman province of Africa, on the borders of Numidia, and was of good family. The hero of his celebrated romance, "The Golden Ass," is called Lucius, comes to Rome ignorant of Latin, and manages by his own exertions to learn the language without a master, being meanwhile reduced to such utter poverty as to sell his clothing. These particulars, without any other authority than that Lucius is said to come from Madama (the birthplace of Apuleius), are generally taken to apply to the author. What is more certain is that he was educated at Carthage and Athens, and travelled over the principal civilized countries of his time. A fellow-student, whose widowed mother Pudentilla was rich and desirous of a second marriage, pressed Apuleius, in spite of his youth, to marry her. For this the young philosopher, after his friend's early death, was prosecuted by the angry relatives of the lady on the score of magic arts having been used to ensure her, their real motive being, of course, to secure the lady's wealth. The witty, learned, manly "Apologia," in which he defended himself, is the best of his writings for style. He was triumphantly acquitted.

He was a warm Platonist, and of considerable and various learning, enriched by his many travels; moreover he had abundant humour and lively fancy, but his constant affectation of quaintness and straining after effect mars the pleasure he would otherwise give. He is seen at his best and his worst in the famous romance of "The Ass," so famous that it received the sobriquet of "golden." It was founded on Lucian's also celebrated tale of the same name, the plot of which, in its turn, had been borrowed from a tale, now lost, by Lucius of Patrae. After all the story does not seem very excellent in itself, but Apuleius uses it as a groundwork on which to build eleven books of as

entertaining a medley of adventures, tales, sketches of manners and customs, satirical hits at the impostures of the priests and magicians of the time, snatches of philosophy and scraps of legend, as were ever penned. The work is simply invaluable as a representation of ancient manners. Boccaccio borrowed from it the second story of the seventh day of the "Decameron." "Gil Blas" and "Don Quixote" are not only modelled on it, but contain episodes directly taken from it—as, for instance, Don Quixote's adventure with the supposed giants, which prove to be wine-skins, and Gil Blas' sojourn with the thieves. The title is due to the hero Lucius witnessing a magician transform himself into a bird, and desiring to imitate her; but by mistaking the ointment, he obtains the form of an ass, whence Juno only delivers him after many adventures. He finishes by becoming a priest of Osiris.

The most famous of all the numberless episodes is the exquisite story of Cupid and Psyche (see *PSYCHE*)—depicting in an allegory the yearning of the soul for perfection; and for this, if for nothing else, Apuleius deserves the immortality he has gained.

There are many philosophical and anatomical works by Apuleius. The best complete modern edition is by Hildebrand (Leipzig, 1842). Good versions of the "Golden Ass," the "God of Socrates," the "Florida," and the "Apologia" are in the volume of Apuleius in Bohn's Classical Library.

APULIA, the name of one of the divisions of southern Italy in the time of the Romans. Its limits were—on the E. and N. the Adriatic Sea, on the N.W. the river Frento, or perhaps the Tiberis, which divided it from the Picentini Samnites on the W., Lucania on the S., and Messapia on the S.E. In modern times the whole of this part of Italy was known to the Greeks by the name of *Lupigia* (Herod. iv. 299), and was inhabited by the Daunii, the Peucetii or Pedunculi, the Messapians, and the Sidentini, who were all said to be descendants of Greek or Pelasgic colonies. The original Apulians were probably a tribe of the Opiet or Osci. (See *Strabo's "Hist. of Rome,"* vol. i.)

This country suffered greatly during the second Punic War when some of its towns sided with Hannibal and others with Rome. The whole finally became subject to the Roman sway. After the fall of the Western empire the possession of Apulia was long disputed between the Goths, the Byzantine emperors, the Lombards, and the Saracens. The Normans conquered Apulia in the eleventh century, and the Norman kings of Sicily styled themselves dukes of Apulia and princes of Capua. These two names included the whole of their continental dominions. When afterwards the monarchy was divided into two kingdoms—namely, Sicily *ultra Phærum* and Sicily *citra Phærum*, the latter vulgarly called the kingdom of Naples—the name of Apulia was definitively limited to one of the four divisions of the continental kingdom, consisting of the Apulia of the Romans and the Messapian peninsula. Apulia, or Puglia as it is now called, is merely employed as the name of a geographical district, and has no political significance. It forms the three provinces of *BASILICATA*, *FOGGIA*, and *LECCE*, in the kingdom of Italy.

APURE, a river of Venezuela, and tributary of the Orinoco, which it joins 500 miles from the sea. It rises in the Andes, has a navigable course of about 300 miles, and steamers ply upon its waters. Its chief affluents are the Paraguaná and Guariaco.

APURIMAC, a river in South America, which carries off all the waters that descend from the eastern declivity of the Andes between 11° and 16° S. lat. Its source is in the N.W. extremity of Lake Titicaca, about 16° S. lat., 72° W. lon. At first it runs to the north, but by a series of curves to the north-east and then to the north-west. In this space its waters are increased by two tributaries, the Culemayo (150 miles long) and the

Villecanayo (220 miles long). Near 12° S. lat. the Apurimac is joined by the Jauja or Xauxa, the largest and most important of its tributaries, about 300 miles long, after which it runs through the plains in a north-eastern direction. On uniting with the Pangoa it is called the Tambo, and after a later junction with the Parobeni receives the name of the Ucayali. Its whole course is about 500 miles, and it empties its waters into the Amazon near 5° S. lat., 74° W. lon.

The rapid course of the Apurimac and its tributaries in a stony bed between high rocks, and the shallowness of their waters, render them, generally speaking, unfit for navigation. The valleys through which they flow, though of considerable length, are rather narrow. Near the sources they are mere ravines, but lower down they widen to an average breadth of 2 or 3 miles, and sometimes even to 5 miles. The Apurimac, however, is navigated by small steamers, even in the dry season, up to its junction with the Mantaro, another of its tributaries.

The country drained by these various rivers is the most important and most populous district of Peru. It is still mostly inhabited and cultivated by the industrious descendants of the ancient Peruvians, who are said to be the best specimens of the aboriginal civilization.

AQUA FORTIS. See *NITRIC ACID*.

AQUA REGIA. See *CHLORINE*.

AQUA TOFANA, the name given to a poison which obtained great celebrity in Italy during the latter half of the sixteenth century. Its invention is ascribed to a woman named Tofana who lived at Palermo and afterwards at Naples, and who sold it secretly to other women under the name of the *mamma* of St. Nicholas. According to the stories prevalent at the time it was largely used by women who wished to get rid of their husbands; and when Tofana was put under examination she confessed to having procured the death of 600 persons. As this evidence was obtained by torture its accuracy must be problematical. The most extravagant stories were current at the time respecting the preparation and the potency of the poison, but it is now generally believed to have been a solution of arsenic.

AQUAMBO or **AKUAMU**, an interior country of Africa, in the region of the Gold Coast, stretching along the banks of the Volta. The portion which lies on the western side of this river is under British protection.

AQUAPIM, an extensive territory lying close to Accra on the Gold Coast, under British protection. The soil is barren on the coast, but inland is well watered and fertile. The chief town is Akwpong.

AQUARIUM was the name formerly given to a tank of water kept in a hot-house for the cultivation of aquatic plants, but is now used to designate any vessel in which either marine or fresh-water plants and animals are kept alive. In the study of natural history during the past two centuries aquatic insects and animals have occasionally been kept in confinement, and in 1790 a number of tanks for this purpose were constructed by Sir John Graham Dalzell; but the history of the modern aquarium may be regarded as commencing about the year 1841. Previous to that time such constructions had been maintained with great difficulty, owing to the want of means for keeping the water pure and the animals confined in a healthy state. This was overcome by Mr. Ward, the inventor of the Wardian cases for plants, who constructed an aquarium in London in which aquatic plants were grown for the purpose of purifying the water. Subsequent investigations by Mr. K. Warrington and Mr. P. H. Gosse resulted in a knowledge of the way in which a balance may be kept between animal and vegetable life, and some of the most beautiful forms of aquatic plants and animals kept in a living and healthy state in the drawing-room or in the study. The principle of this may be briefly expressed as

follows:—Stagnant water cannot sustain life because of its want of vital air. To keep the water charged with oxygen is the first condition necessary, and the supply of suitable food for the living forms is the second. The discovery of the relations between animal life and vegetation, and an acquaintance with the influence of wind on water, enable us to meet both requirements. Animals give to the air or to the water carbonic acid gas, by which plant life is sustained. Plants give forth oxygen, by which animal life is supported. Thus when suitable numbers of plants and animals are kept in a living state in the vessel or tank the conditions required meet. The plants under the influence of sunshine give to the animals the life-supporting element, and the animals in turn yield the constant supply of carbonic acid gas. This arrangement having been made, all that is necessary is to do for the artificially filled vessel what the wind does for the stream and river, lake and ocean. It *aerates* the water by commingling with it. In the case of the domestic fresh-water tank it is sometimes possible to have a small jet continually playing in the centre; but whether the water be fresh or salt frequent agitation is absolutely necessary to expose fresh surfaces to atmospheric influence. Let the balance of animal and vegetable life within an aquarium be maintained, and the conditions of agitation observed, and any frequent renewal of the water becomes entirely unnecessary.

Where sea water is not obtainable it may be artificially prepared by adding the necessary salts. The following list of materials for the formation of artificial sea water may be useful to those living at a distance from the sea. To 9 gallons 5 pints of water add 43½ ounces of chloride of sodium, 6 ounces of chloride of magnesium, 1½ ounce of chloride of potassium, 21 grains of bromide of magnesium, 7½ ounces of sulphate of lime, and 21 grains of carbonate of lime. The ingredients are supplied by any chemist.

The water thus prepared is not fit for the reception of living animals at once, but a few plants, such as some of the green algæ species of *Ulva* and *Conferva* must first be planted, and these will soon render it suitable for the support of animal life. Seaweed, as a rule, will not bear transplanting, but the sea water is so impregnated with the spores of vegetation that if a few fragments of rock be taken from under water and placed in an aquarium a growth of weed will speedily commence.

When an aquarium is fairly started it will require constant attention if it is to be kept in a fit state. All dead animals and plants must be removed, and such animals must be kept as will assist in purifying the water. In a marine aquarium this may be done by keeping some of the molluscous animals, such as the common periwinkle or limpet, and in a fresh-water aquarium similar means are equally necessary. Several works on this subject have been published for the direction of amateurs, but success in managing an aquarium can only be attained by intelligent experiment, and at the cost of a few or perhaps a good many failures.

The first public aquarium was opened in the London Zoological Gardens in 1853, and was attended with so much success that the example was followed by several provincial towns and also on the Continent, where they now form a feature of several large towns and cities. A large aquarium was opened in 1871 at the Crystal Palace, and one still larger at Brighton in 1872. The Westminster Aquarium was opened in 1876. In the Crystal Palace aquarium a large reservoir of water is maintained, containing five times the quantity of that in the show tanks, and an arrangement is made by which a constant circulation is maintained, a strong jet of water being also constantly forced into each tank from the top. In the Brighton Aquarium there is no circulation of water, but it is kept aerated by pumping air into the tanks through large

tubes. At the Westminster Aquarium the water which passes through and fills the tanks travels over a distance of nearly three miles between the beginning and end of its circuit for the purpose of aeration.

("The Aquarium," by Mr. P. H. Gosse, London, 1856; "On the Principles and Management of the Marine Aquarium," by Mr. W. R. Hughes, 1874.)

AQUARIUS (the Water-bearer), one of the twelve zodiacal constellations, which the sun traverses during a part of January and February. Its Greek name is *Udroskos* (the Water-pourer). In the Indian zodiac it is simply a water jug; in the Egyptian, a male figure holding two urns from which water flows. Its probable origin is the watery season of the year in which the sun was in this sign.

AQUATIC PLANTS, in horticulture, are those which are naturally found floating in deep water, and are carefully distinguished by the cultivator from mere marsh plants. The management of them when they are hardy is of the simplest kind, nothing being necessary beyond planting them in boxes with holes in their sides, and sinking them 3 or 4 feet below the surface of a pond, so that the boxes lie upon or among the mud at the bottom.

But for those which demand the protection of the stove or greenhouse some additional precautions appear requisite. If left to themselves in such situations the uniformity of temperature is such as to deprive them in some measure of the repose that they naturally receive from the alternation of seasons; kept constantly in a growing state, their excitability is gradually destroyed, and death ensues as a matter of course.

Various methods of treating such plants have been recommended; but they all depend for their success upon keeping in view the principle of periodical rest and rapid growth under a high temperature, with little air during the season of vegetation.

AQUATINT. See ENGRAVING.

AQUEDUCT or **AQUEDUCT** (*aqua ductus*), as it was formerly more correctly written, is composed of two Latin words, *aqua* (in the genitive case *aquæ*) and *ductus*, signifying together a conductor or conduit of water. In this its more extended sense the term aqueduct may be applied to all sorts of pipes and channels for the conveyance of water, but it is commonly restricted to constructions formed above the surface of the ground for the purpose of conveying streams of water in a regular but slightly descending current across valleys and over plains from one comparatively high point to another, following a winding course when the descent in a direct course would be too rapid. Though we have not in this country an example of the sort of structure which the term designates, it may be exemplified by such erections as Barton Bridge, in Lancashire, which carries the Duke of Bridgewater's canal over the river Irwell; the bridge which carries the Edinburgh and Glasgow Canal over the valley of the Water of Leith at Slateford; and the numerous railway viaducts erected in recent years. The former of these have been sometimes called aqueducts, but this application of the term only leads to confusion, unless *bridge* be superadded; structures for the purpose of carrying a canal are indeed more strictly viaducts than aqueducts. Nevertheless, such is the form and structure of an aqueduct—a series of piers equidistant, or nearly so, with arches connecting their heads to form one continuous and nearly level line, on the back of which is the channel or water-course. This, in Roman aqueducts, was either arched over or covered with a flat stone coping.

Contrivances for the conveyance of water from a distant source for the supply of a city are of great antiquity. Herodotus (iii. 60) describes the mode in which Eupalinus, an architect of Megara, supplied the city of Samos with water by a tunnel 7 stadia or 4200 Greek feet long, through a hill 900 Greek feet high.

Aqueducts were most extensively used by the Romans, and in the vicinities of many of their more important cities in Asia and Africa, as well as in Europe, remains of extensive constructions of the kind yet exist.

Rome itself was supplied with water from sources varying from 30 to 60 miles in distance, and at one period of its history no less than twenty aqueducts brought as many different streams of water across the wide plain or Campagna in which the city stands. Great portions of the distance were of course in every case occupied by artificial channels winding along the sides of hills and mountains; and long tunnels carried the streams through these natural barriers when occasion required; but nevertheless the arcaded duct led the streams across the deep valleys, and the aqueduct was in every case required to carry it onwards from the hills over the wide plain into reservoirs in Rome. In one of these Roman aqueducts the series of arches is calculated at nearly 7000, their height being in many places more than 100 feet. There is nothing more interesting or more really beautiful in the existing ruins of ancient Rome than the remains of these splendid works, some of which, having been restored and repaired, supply the modern city abundantly.

Sextus Julius Frontinus, who was inspector of the aqueducts of Rome under the Emperor Nerva, has left a treatise on this subject, which contains much valuable information.

The centre figure in the Plate prefixed to this volume represents the Aqua Marcia, 56 miles in length, which was constructed by the prætor Q. Martins Rex in 146 B.C., and restored in 1862. It enters Rome by the Porta Pia, and brings a supply of water from the Sabine mountains, which is considered the purest in Rome. Over it, near the Porta Pia, flows the Aqua Claudia (see the first illustration), which was erected in A.D. 50 by the Emperor Claudius, and it extends from the vicinity of Subura, a distance of 56 miles. The third illustration represents an aqueduct at Metz, which originally extended across the Moselle, and conveyed an abundance of excellent water to the city from Gorze. The noble arches have given way under the force of the river, but the others are still perfectly solid.

The most celebrated modern aqueducts are those of Caserta in Naples, of Mantes in France, near Versailles in France, and of Benfen, (called *Aguaes Lieres*), near Lisbon in Portugal. The latter was completed in 1738, and is about 3 leagues in length. Near the city it is carried over a deep valley for a length of 2400 feet by a number of fine arches, the largest of which has a height of 250 feet and a span of 115. The stupendous aqueduct on the Liffeme Canal (1607 feet in length and 126 feet high) was built by Telford and opened in 1805. The Croton Aqueduct, which conveys the water of the Croton River to New York, 38 miles distant, is, however, the most important modern work of the kind. It was made between 1837 and 1842, and is capable of discharging 60,000,000 gallons in twenty-

AQUEOUS ROCKS, in geology, are those which are formed under water, either by the mechanical action of running water or by chemical processes and organic remains. Water lays down gravel, sand, or mud, according to the state in which it is flowing, and these deposits will also vary with the nature of their source. The formation of different layers may easily be seen in the delta formed by a stream running into a lake. Stratification, then, in rocks is a proof of their aqueous origin; and where this does not exist the test lies in the presence of fossils.

AQUIFOLIA CÆLÆ, a name sometimes used in botany for the *crataegus*, to which the holly tree belongs.

AQUILA, a province of Italy, formerly named *Abruzzo* (Liberi), is bounded on the E. by the Gran Sasso d'Italia, the highest portion of the Central Apennines. It is almost

entirely covered with mountains, and there are no plains, but some beautiful and fruitful valleys watered by various streams which run through them. The area is 2510 square miles, and the population in 1882 was 353,024.

AQUILA, the capital of the above province, is situated on a hill, at the foot of which flows the Aterno, and lies 58 miles N.E. of Rome. It was founded in the year 1240 by the Emperor Frederick II., who utilized the ruins of the ancient Sabine town *Amitemum* for the purpose, and transferred the inhabitants thither. Amitemum was the birthplace of the historian Sallust, and its remains can still be traced about 3 miles from Aquila. The prosperity which it attained was greatly interfered with by war, and by earthquakes in 1688, 1703, and 1706. It is now a well-built city, with a citadel and cathedral, and numerous other places of worship. It also possesses a fine town-hall, a theatre, hospitals, and several ancient mansions. The principal manufactures are linen, wax, and paper; and a considerable trade is carried on in saffron, which is extensively grown in the neighbourhood. Aquila enjoys a pure and healthy atmosphere, owing to its lofty situation, and has the advantage of a good supply of water, conveyed from Monte San Giuliano, 3 miles distant, by means of an aqueduct, constructed during the flourishing period of its history. There are several fine public fountains. The population in 1882 was 18,426.

AQUILA, according to Epiphanius, was a relative of the Emperor Hadrian, and converted from idolatry to Christianity, but afterwards excommunicated on account of his idolatrous astrology. He embraced Judaism, was circumcised, and translated the Old Testament literally into Greek. The Jews preferred his translation to the Septuagint. It appears also from Irenæus that the Ebionites used the translation of Aquila in order to support their Judaizing tenets. The remains of this translation have been edited by Montfaucon, Martianay, and others, in the "Hexapla" of Origen.

AQUILARIA is a genus of plants belonging to a tribe, Aquilareæ, of the order THYMELÆE. *Aquilaria Malaccensis* (the *bois d'aigle* or eagle-wood) is a native of Malacca, and produces a whitish-yellow wood. *Aquilaria Agallocha* is a native of North-east India and other places in the East Indies, where it is called *lignum-aloes* or *aloe-wood*. The wood has a fine scent, and is supposed to be the *calambac* or *agallochum* of the ancients. In a healthy state this wood is white and inodorous; but it is subject to the attacks of disease, which causes the secretion of a resinous matter, and the wood then becomes coloured, and gives out a powerful scent. This secretion resembles camphor in many of its properties, and has a bitter flavour; hence the name of the tree. The aloe-wood tree is of great size, as much as 120 feet high and 12 feet in circumference; but it appears to be confined to a few places, such as the hills of Silhet. The natives go two or three days' journey into the jungle, and cut down all the aloe-wood trees, young and old. The *agjur* or *uttur*, as the precious aromatic wood is called, is only partially distributed in the trunk and branches, and only in a few trees. The natives hunt for it by chopping off the bark of the felled trees, and into the branches, until they see the dark veins which yield the perfume. They cut this part of the wood out, and thus only make use of small portions of numerous trees cut down. The Sanskrit word for it is *aguru*. It was also well known to the Persians and Arabs. [See EAGLE-WOOD.] These trees must not be confounded with the *Aloexylon*, *Aquilechum* or *aloes-wood*, which is a tree belonging to the natural order Leguminosæ, and which also yields a scented wood used by the Chinese in medicine and perfumery.

AQUILEIA, a town of the ancient Veneti, was made a Roman colony in B.C. 181. It was built near the western bank of the river Sontius (now Isonzo), in a low plain,

watered by numerous rivers. It was a place of great trade, for, although several miles distant from the coast of the Adriatic, vessels could reach it through canals which communicated with the rivers *Natissa* and *Anfora*, which flow near it. It was the principal bulwark of Italy on the N.E. frontier. The walls were 12 miles in extent, and the city was adorned with an amphitheatre and other splendid buildings. The *Via Æmilia*, a continuation of the Flaminian road from Rome, led through Ariminum and Bononia to Aquileia. It was a favourite residence of the Emperor Augustus, and was often called the Second Rome. Its population then exceeded 100,000. The Emperor Maximian perished here, and in the neighbourhood Constantius was killed in battle. Aquileia was exposed to the first attacks of Alaric and the other barbarians who successively invaded Italy from the north-east. Attila stormed it, and after an obstinate defence pillaged and destroyed it by fire, after butchering the greater part of its inhabitants, A.D. 452, and it never recovered its former splendour. It was about this time that many fugitives from various towns destroyed by Attila escaped to the islets in the lagoons, where Venice was afterwards built. In the sixth century a schism arose between the see of Aquileia and that of Rome, and metropolitans of Aquileia assumed the title of patriarchs, which was used in the Greek Church. Charlemagne and his successors bestowed privileges on the see of Aquileia, which had already become reconciled with that of Rome, and had obtained from it the recognition of the patriarchal title. The wars between Frederick II. and the popes, and the factions of the Guelphs and Ghibellines, disturbed the country; and these, added to the unhealthiness of Aquileia occasioned by the stagnant waters, induced the patriarchs in the thirteenth century to remove their residence to the castle of Udine, which town then rose on the decline of that of Aquileia. In 1420 the Venetians conquered Friuli, and Udine submitted to them. Thus ended the temporal dominion of the patriarchs. Their spiritual authority they retained until the year 1758, when the patriarchate was finally abolished with the consent of the pope. Aquileia, or Aglar, is now only a small fishing village of Austria, with about 2000 inhabitants, and forms part of the circle of Istria, in the government of Trieste. There are many interesting remains in the neighbourhood. The road from Venice to Trieste passes through Palmanova, about 8 miles north of Aquileia.

AQUINAS, ST. THOMAS (that is, Thomas of Aquino, in Naples), the greatest of the Schoolmen, was a younger son of Landolf, count of Aquino, a nephew of the Emperor Frederick I. He was born in 1225 or 1227, in the castle of Rocca Secca, the seat of his family, near Aquino. He received the elements of education at the monastery of Monte Casino, and afterwards went to the University of Naples, where he displayed an intense love of study, and the most unwearied application. In the fifteenth year of his age he decided to enter the order of the Dominicans, and took the first steps necessary to that end. His family, however, offered great opposition, and he was carried off to Rocca Secca by his brothers, and confined there for two years. During this detention every effort was made to shake his determination, but without effect. It is declared by the Bollandists that during this period his brothers, finding all argument unavailing, endeavoured to tempt him from his vow of celibacy by the introduction of a beautiful courtesan to his room, but that Aquinas seized a burning brand from the fire and drove her out. The Dominicans, who had formed favourable opinions of his zeal and abilities, made strenuous efforts to regain him, and prevailed upon the pope, Innocent IV., to interfere, and by his command Aquinas was permitted to return to the convent, where he assumed the habit in the year 1243. His superiors having noticed his predilection for theological study, sent him to

Cologne to attend the lectures of Albertus Magnus upon theology and philosophy. Here he prosecuted his studies with such taciturnity that his fellow-students styled him "the great dumb ox;" but it is said that his master, who had detected his great ability, declared that "this ox would one day fill the world with his bellowing."

In 1245 he accompanied his master to Paris, where he remained three years, at the end of which he graduated as a bachelor of theology. He returned to Cologne with Albertus in 1248, where he was ordained a priest. In 1253 he again went to Paris, where he entered into the controversy which had arisen there between the University of Paris and the mendicant orders, and published a defence of the monastic life. The dispute was referred to the pope, and the young Aquinas was chosen by the friars as their champion. In the discussion he had for his opponent William of St. Amour, a celebrated scholar, who had been chosen by the university as their ablest representative; but the victory remained with Aquinas.

He now began to lecture publicly on theology, and soon attracted great attention—scholars flocking to him from all parts of Europe; and in 1257 his fame had become so well established that the University of Paris, against which he had contended, conferred upon him the title of doctor of theology. In 1261 Pope Urban IV. recalled him to Italy, in order to avail himself of his advice; and Aquinas subsequently accompanied his Holiness in his journey, during which he delivered lectures upon theology and philosophy in Rome, Bologna, and Pisa.

In 1263 he visited England, and was present at the chapter of the Dominican order held in London in that year. Clement IV., who became pope in 1265, offered him the archbishopric of Naples, which he declined, as he did also the abbacy of Monte Casino. In 1271 he again visited Paris, and delivered a number of lectures, which, as before, attracted immense audiences. In 1272 he was recalled to Naples, where he filled for a time the office of professor of theology. In 1274 he was summoned by Gregory X. to attend the Second Council of Lyons, which had been convened for the purpose of endeavouring to reconcile the Greek and Latin Churches. Though feeble and worn with illness he set out on the journey, but becoming too weak to proceed he was carried at his own request to the Cistercian Abbey of Fossa-Nuova, in the diocese of Terracina, where, after lingering several weeks, he died on the 7th March, 1274, at the age of forty-eight. The possession of his body was eagerly claimed by several cities; by none with more importunity than Paris. The monks of Fossa-Nuova, however, refused to part with it; but it was afterwards deposited, by order of Urban V., at the city of Toulouse, where it was placed in the Dominican convent, a magnificent tomb being erected over it, which remains to the present day. Many miracles and prodigies were declared to have occurred during his lifetime, and more still after his death, and he was duly canonized by Pope John XXII. in 1323. The title of *doctor ecclesie* was conferred upon him by Pius V. in 1567, but that by which he is best known is "the angelic doctor," conferred upon him by his disciples and admirers from the fulness and precision with which, in the first part of his "*Summa*," he defines the nature and attributes of the angels.

He was undoubtedly gifted with vast mental powers, all of which were devoted with the most intense enthusiasm to the study of theology and the service of the church. His influence upon the thought of Europe has been immense, while the science of theology as understood by the Catholic Church owes more to him than to any other thinker since St. Augustine. He was a most prolific author, and the complete edition of his works, published at Rome in 1570, filled seventeen folio volumes. The most famous of these, however, and that upon which his

fame chiefly rests, is the "Summa Theologiæ." In this work it was his aim to present to the church and the world, according to his own words, "a luminous and methodical compendium of the entire system of Christianity, from the sublime doctrine of the existence of God, down to the humblest precept of evangelical morality." As a preparation for this great undertaking he made a complete investigation of the theology of the church as previously taught and decided by the councils and the fathers, devoted a considerable period to the close study of the Scriptures, and finally mastered the philosophy and method of Aristotle. During these studies he published from time to time some of their results in the shape of "A Commentary on the Four Books of Sentences of Peter Lombard;" several commentaries on different parts of the Scriptures; and finally, commentaries on the principal works of Aristotle. Thus fortified and prepared, he devoted the last nine years of his life, though without intermitting his public work as lecturer, to the accomplishment of this great undertaking, and he was still engaged upon it when he was overtaken by death. The work was to have been completed in three divisions: the first treating of the nature and attributes of God, and the subjects connected therewith; the second of man, dealing with ethics, psychology, and the theological and natural virtues; and the third with the office, work, and church of Christ. He was enabled to finish the first and second portions, and in the third had reached as far as the sacrament when the work came to a premature close. It was afterwards completed by other hands, with the line he had indicated. By many scholars this work is regarded as being the supreme intellectual monument of the thirteenth century, and it is still the "authentic, authoritative, acknowledged code of Latin Christianity." The Dominicans ever regard him as their brightest ornament, and at a general chapter of the order held at Paris it was decided that every member should be bound under fear of punishment to defend the doctrines taught by Thomas Aquinas. His great fame and influence naturally inflamed the jealousy of the rival order of the Franciscans, and at the beginning of the fourteenth century one of their members, Duns Scotus, came forward as the declared opponent of several of the doctrines of Aquinas. The dispute led to the formation of the rival schools of "Thomists" and "Scotists," whose disputes lasted for ages—some of the points of controversy raised having been authoritatively decided by the Catholic Church during the present generation.

It is possible that more general attention may be again attracted to the teachings of Aquinas, as the present Pope has called the church over which he rules to the renewed study of his philosophy and method, declaring it to be the best antidote against the prevailing systems of the age, towards which the Church of Rome has ever displayed considerable antipathy.

The best edition of the works of Aquinas is generally believed to be the one already referred to, viz. that published by Pius V. at Rome in 1570. Several editions have been subsequently published, among which may be mentioned those of Venice, in eighteen volumes folio (1563-1594); Paris, twenty-three volumes (1676-41); and a second Venice edition in twenty-eight volumes quarto, issued in 1747, which is by many scholars reckoned the most accurate and complete. Among English works on this subject the most recent is that of Dr. R. B. Vaughan, entitled, "St. Thomas of Aquino: His Life and Labours" (London, 1872).

AQUINO, formerly called *Aquinum*, an ancient but decayed town in the province of Caserta or Terra di Lavoro, in Italy, stands 6 miles west of San Germano, the ancient *Casertum*, on the railway from Rome to Naples. It was a Roman colony, and a large and populous city in

the time of Strabo; the *Via Latina* passed through it. Juvenal, the Roman satirist, was born at or in the neighbourhood of Aquinum. *Pescennius Niger*, one of the competitors for the empire after the death of *Pertinax*, and St. Thomas Aquinas, were also natives of this place. Aquinum suffered greatly by the various invasions of the barbarians after the fall of the empire. At present Aquino contains about 2000 inhabitants, and is the seat of a bishop. The ground is covered with ruins of buildings of various ages and styles, among which are the remains of a theatre and of an amphitheatre, and a lofty wall of square stones without cement, which formed part of a magnificent Doric temple.

AQUITA'NIA, one of the great divisions of ancient Gaul. The limits of Aquitania, as stated by Cæsar, were the river Garonne, the Pyrenees, and the ocean. The original Aquitanians are supposed to have been of Iberian race, and distinct from the Celts. The country was not subjugated until B.C. 28, when Augustus sent Marcus Valerius Messala to conquer it. In the division of Gaul into Roman provinces as settled by Augustus, the limits of Aquitania were extended northwards as far as the Loire, and eastwards to the Mount Cebenna (the Cevennes), which formed the limits of the *Narbonensis* province. In the subdivisions of Gaul under the later emperors, the Aquitania of Augustus was divided into three provinces. Under the reign of Honorius, the Visigoths took possession of Aquitania, which they kept till Clovis, king of the Franks, defeated them near Poitiers, A.D. 507, and killed their king, Alaric II. Aquitania then became part of the monarchy of the Franks; but under the successors of Clovis it was given as an appanage to Charibert, a younger son of Clotarius II. In 768 Pepin conquered Aquitania and reunited it to the French monarchy. But Aquitania had undergone another change in its southern limits. The Vascones, a Spanish people, being hard pressed by the Visigoths, crossed the Pyrenees and settled in the south part of Aquitania, which from them took the name of Vasconia or Gascony; the more northern parts of the same province continued to be called Aquitaine, and afterwards, by corruption, Guienne. In the eleventh century Vascones became united to the duchy of Aquitaine, which, under the successors of Charlemagne, had become one of the great fiefs of the French monarchy, and virtually independent of the crown. Eleanor, the heiress of William, last count of Poitou and duke of Aquitaine, married Louis VII., king of France, but being repudiated by him she married Henry, duke of Normandy, afterwards Henry II. of England, who thus became possessed of Guienne, Poitou, Gascony, Anjou, in short of the whole of Aquitania in its most extended sense. This was the origin of long wars between the two kingdoms. Charles VII. conquered Guienne and the other districts above mentioned, and took Bordeaux in 1451-52, and reunited the whole to France. The name of Guienne continued to be used as that of one of the provinces of the old monarchy, though restricted to a very small portion of the former Aquitania, until the French revolution. Aquitaine comprises the present departments of Dordogne, Lot, Aveyron, and a portion of Tarn-et-Garonne.

ARAB, a noble breed of horses, native of Arabia and Northern Africa. The Arab is the friend and companion of his ever-wandering master, who often has to rely on the fidelity and endurance of his steed to aid his escape from his enemies. The best points in the pure Arab are the long arched neck, the shoulders sloping backwards, the high withers, and the head. "The broadness and squareness of the forehead," says Youatt, "the smallness of the ears, the prominence and brilliancy of the eye, the shortness and fineness of the muzzle, the width of the nostril, the thinness of the lower jaw, and the beautifully developed course

of the veins, will always characterize the head of the Arabian horse." The legs are small, but the tendons are boldly detached from the bone, and the muscles of the forearm and thigh bespeak great strength and endurance. The chest is rather too narrow. Youatt discredits the general opinion that the Arab horse owes his power of endurance to the hardships endured in the desert when young. "The real fact is," he contends, "that the Arabs select for their breeding-places some of those delightful spots known only in countries like these, where, though all may be dry and barren around, there is pasture unrivalled for its succulence and its nutritious or aromatic properties. The powers of the young animal are afterwards developed, as they alone could be, by the mingled influence of plentiful and healthy food, and, except in one day of trial, sufficient but not cruel exercise." The first Arab horse introduced into England was bought for James I., but proved unsuccessful both as a racehorse and a sire. The next genuine Arab was the Darley Arabian, imported in Queen Anne's reign from Aleppo. From him a large proportion of our English racehorses are directly sprung. By selection and careful training the whole body of English racehorses have come to surpass in fleetness and size the parent Arab stock.

ARABESQUE. This word literally means "in the Arabian manner," and is a French form of that expression. Its use, however, is limited to the name of a fanciful style of ornament commonly employed in connection with architecture, but including also certain modes of ornamentation applied to book borders, silver work, pottery, &c. It consists of scrolls, figures, foliage, flowers, fruit, the tendrils of plants, &c., generally interlaced, and often fantastic or grotesque. It has been used from a very early period, being found in the monuments of Egypt and those of Greece and Rome. Some very fine specimens have been found in the houses unearthed at Pompeii and Herculaneum. There are some beautiful examples of the Saracenic use of this mode of ornament in the Alhambra; but the most celebrated arabesques of modern times are those with which Raphael ornamented the piers and pilasters of the arched gallery (loggia) of the palace of the Vatican which bears his name. The term is more applied to painted than to sculptured ornament, though it includes sculptural representations in low relief.

ARAB GIR or **ARAB-KIR**, a thriving and well-built town of Turkey in Asia, situated in a rocky valley near a tributary of the Euphrates, 150 miles S.S.W. of Trebizond. The prosperity of the place is owing in a great measure to the industry and enterprise of the Armenians, who comprise about one-fourth of the inhabitants; the remainder are Turks. The chief industry is the manufacture of goods from English cotton yarn. The country around is fertile, and contains a large number of mulberry trees. Population, 36,000. The old town, about 2 miles distant, now called Eski Shehr, contains the ruins of an ancient castle.

ARABIA. This large country, the area of which is about four times that of France, is included in the continent of Asia. It presents the form of a vast peninsula, in shape that of an irregular parallelogram, connected with the south-western extremity of the continent of Asia by an isthmus of sandy deserts, the breadth of which, from the northern end of the Gulf of Akaba to the mouth of the Shatt-el-Arab (the Euphrates) in the Persian Gulf, may be estimated at about 800 English miles. It is situated between 12° and 30° N. lat., and 32° and 59° E. lon., partly within and partly to the north of the tropical region, the tropic of Cancer dividing it into two nearly equal parts. It is bounded on the N. by Syria and the Euphrates, on the E. by the Persian Gulf; the Indian Ocean (called here the Arabian Sea and the Sea of Oman) washes the long extent of its south-eastern coast; the Straits of Bab-el-

Mandeb and the Red Sea form the western boundary. Cape Rasalgate or Ras-al-Had is the most eastern projection of the peninsula; Cape Muscudon (Cape Maketa of the ancients) extends in a north-easterly direction towards the Straits of Ormuz; Cape Aden, near the south-west angle of the peninsula, can be seen between 15 and 20 leagues off at sea, as a steep and lofty rock. Bab-el-Mandeb, or the "Gate of Danger," the dangerous passage from the Indian Sea into the Red Sea, is the point of the peninsula which is situated furthest to the south-west; and Cape Mohammed marks the projection of the Sinai Mountains between the Gulfs of Suez and Akaba, the two northern branches or gulfs of the Red Sea. The extreme length of the peninsula is 1300 miles, its extreme breadth 1500—the apex of junction with Asia being, as above stated, only about 800 miles broad. The area is about 1,000,000 square miles.

Physical Geography.—The whole peninsula of Arabia consists of an elevated table land, declining on the north towards the Syrian desert, and encircled along the sea-coast with a belt of flat sandy ground, from 30 to 80 miles in width. This flat country, beginning at Suez and extending round the whole peninsula to the mouth of the Euphrates, is called Gaur or Tehamah, i.e. the "Low-land," as distinguished from Nejd, or the "High-land" of the interior. The two are in general divided from each other by a coast-range of mountains, having a mean elevation of 3000 feet. The Tehamah, which term is restricted by some writers to the southern section between Yemen and the coast, seems to have formed part of the bed of the sea, from which it has been slowly upheaved. It abounds in marine fossils and saline deposits, and appears to be advancing according as the sea continues to recede. Although everywhere extremely hot and generally unhealthy, it contains, especially in the south, many well-watered and fertile tracts, affording good pasturage and yielding heavy crops. A very large portion, at least one-third, of Arabia consists of irreclaimable desert, and of the districts considered as cultivable the general aspect is that of desolate barrenness and sterility. In fact, except as connected with the founder of Mohammedanism, the country is one of the least importance and interest of any in the world.

The old geographers made a triple division of the peninsula into Arabia Petraea, Arabia Deserta, and Arabia Felix, the credit of which is usually assigned to Ptolemy. The first comprised the north-west, the second the centre, and the third the south-west. The denomination applied to the latter, Felix or Happy—"Araby the blest," in the style of the poet—arose out of the unfounded idea that precious commodities of India, which the European nations received through the medium of Arab traders, were the growth of their own soil. The arrangement is vague and arbitrary, and was never recognized by the native geographers. In fact, the country has never had any systematic civil divisions. But certain portions of territory, with very indefinite limits, are distinguished by particular names. The best known of these are comprised within the ring of lowland which encircles the peninsula. Within this ring of coast-line, in fact, there lies nearly everything of interest in Arabia. Commencing from the north-west these districts are as follows:—1, *Bahr-el-Tour Sinai*, Desert of Mount Sinai; 2, *El Hejaz*, Land of Pilgrimage; 3, *Yemen*, the south-western tract; 4, *Hadramaut*, extending along the southern coast; 5, *Oman*, the Kingdom of Muscat, a south-eastern territory; and, 6, *El Hassa or Laha*, on the Persian Gulf. *Nejd*, or *Nejd*, is the settled country on the high plains of the interior. Of these districts we here present the general geographical features, so far as to give a view of the main peninsula of which they form a part.

1. *Bahr-el-Tour Sinai*, or the Sinaitic Peninsula, is a

small triangle having its apex on the Red Sea, its base on Palestine, and its sides formed by the Gulf of Suez on the west and that of Akaba on the east. The intervening space and its northerly continuation has been the scene of events perfectly unique in the history of nations, for it is the actual "wilderness" in which the host of Israel wandered after the departure from Egypt. The name is appropriate, for it is a mere collection of naked rocks and craggy precipices, intersected by long narrow defiles and sandy valleys, in which tamarisk bushes, dwarf acacias,

with snow every year, and one point of which is generally believed to be the biblical Sinai.

2. *El Hejaz*, or Land of Pilgrimage, lying between 28° and 21° N. lat., along the eastern shore of the Red Sea, from which it stretches inland with varying width of from 60 to 150 miles, is the Hejaz or holy district of the Mohammedan world. Within it are situated the sacred cities of Mecca and Medina; and, except in Jeddah and other small parts, with a narrow strip of country inland, no one but Moslems can here tread under pain of death.

There is no interest at all about the Hejaz except as derived from its containing the holy cities, for, except the desert itself, there is probably no part of Arabia so arid and destitute of fertility. The great and barren mountain range of Sherā (the "Seir" of the Bible) commences in the north of the peninsula, and runs down almost its entire length as a kind of coast range, at varying distance from the Red Sea. Between the latter and the mountains there is, for the most part, a low sandy tract; but here and there the range comes down to the sea and forms bold promontories along the coast. Approaching Mecca, this range takes an easterly direction, again nearing the shore further to the south. This crescent-shaped bend contains the highest portion of the whole range, some of the peaks reaching 8500 feet. The tract round Mecca is traversed by several offsets from the great range, and between these the general aridity of the Hejaz is relieved by some fertile valleys and plains, in one of which Mecca is situated. In the neighbourhood of Medina, too, and at the pilgrim station of Kholeys, a few days' journey north of Mecca, there is also some cultivated land, the result of springs. With these exceptions the aspect of the Hejaz is barren; stony in the north, sandy to the east and south; what little irrigation it possesses is only from deep-sunk and brackish wells; the spring rains supply a few streams which, however, rapidly dry up under the hot summer sun. Over the whole region the only routes of travel are camel-tracks, the direction of which is determined by the scanty wells and a few villages. The main tracks are the great Syrian and Egyptian pilgrim routes, but most most pilgrims nowadays avoid the land journey by crossing to Jeddah by sea, and then walking the 40 miles between that seaport and Mecca, or traversing it on mules, camels, or donkeys. Jeddah, the harbour of Mecca, has a good port, but the entrance is dangerous on account of coral cliffs and shoals, which are common along the northern portion of the coast



Base of Mount Sinai.

any shrubs, and some kinds of euphorbias are almost the only vegetation. In a few favoured spots may be seen a cluster of date palms, and after the spring rains a few tufts of grass make their appearance, which before long, however, wither under the scorching heats of summer. Running streams there are none, unless a rivulet or two flows by the rocks, and which dry up in the course of the next few months, are to be considered in this light; but not even these are to be relied on as an occasional standing pool of water, or a well filled with water of any good character as that in the rest of the desert. In the case of this desert lies a mountain group, capped

also, but are nowhere so numerous as on the coast south of Jeddah. The coast here is low, bordered by sand hills, and it maintains this character for a great distance.

3. *Yemen*.—Near the maritime town of Hall, the province of Hejaz ends, and that of Yemen commences; and eastward of the mountains in that latitude is the province of Asir. The chief value of Hejaz is rather of a political than an economical character, giving to the master of the "holy cities" a great prestige, and perhaps his best title to the caliphate, or headship of Islam. Yemen, on the contrary, is valuable for its own sake—a land of fertile and well-watered valleys, rich pastures, and perennial

streams, and dotted over with numerous flourishing towns and villages. Fully one-fifth of the entire population is concentrated in this narrow corner of the peninsula, where settled and agricultural communities, elsewhere extremely rare, have existed from the dawn of history. This exceptional position is partly due to the greater mean elevation of the land, partly to its rich soil and happy configuration, calculated to receive from the Indian Ocean and retain in its sheltered valleys an abundance of moisture. Nominally, Yemen is a Turkish vilayet, but the writ of the Padishah runs little beyond the range of his cannon. The real rulers are the native chiefs, locally called sultans, the most important of whom is the Sultan of Sana. The various chiefs exercise a sort of patriarchal sovereignty, some being tributary to the Turk, and others allied by treaty with the British, who hold very strongly the adjoining south-west corner of the peninsula, or country of Aden. Among the towns near the coast are Sana, on a plateau about 4000 feet high, Loheia, Hodeidah, and Mocha. The mountains in the Yemen province have a rugged aspect. The Tehamah, or low land between them and the sea, has generally a fertile soil; and the valleys among the mountains are well cultivated. It is, in fact, in this region that Arabian vegetation obtains its most varied and valuable development; the coffee

plant having for several centuries attained its most extensive distribution and its highest standard of produce in Yemen, where it is cultivated throughout about half of the upland district, the best quality of berry being that which ripens on the western slopes of the mountains in the neighbourhood of Sana. The same fertility which caused this province to be renowned from remotest ages for the excellence of its vegetable products, gave to this part of the peninsula the name of Arabia Felix, or "Happy Arabia." Cape Bab-el-Mandeb terminates this side of Arabia in 12° 40' N. lat., 41° 12' E. lon. It is distant from the opposite coast of Abyssinia about 14 miles; and the intervening strait is divided into two by the small island of Peran. This island, which commands the southern entrance to the Red Sea, in British occupation, as are also the town and district of Aden on the southern coast of Yemen, extending some 80 miles eastward of the Straits of Bab-el-Mandeb.

4. *Hadramaut.* Next to Yemen, and lying along the coast of the Indian Ocean, from Aden to Cape Ras-el-Had, a distance of 1200 miles, is one of the least inviting and least visited parts of Arabia. Along its whole length it presents much the same dreary appearance as that of the Hejaz—a narrow fringe of sandy coast backed by mountains, while far beyond these there extends the great sandy



Mountains of Seir.

desert, varied, however, near the mountain slopes by oases of considerable fertility. Baron de Wrede, whose description of this country was published in the *Journal* of the Geographical Society of London, crossed several terraces and plateaus, rising higher and higher as they receded from the sea, and crowned at many parts by granitic rocks with craggy summits. He visited the desert El Ahkaf, called Bahr-el-Suffi, one of the most extraordinary tracts on the surface of the globe. It is an immense sandy plain, about 1000 feet below the level of the high land (from which the Baron descended), and strewn with numberless undulating hills, without any trace of vegetation. There are many spots of dazzling whiteness, which contain deep chasms filled to the brim with powder-like sand. The traveller, having thrown a plummet of about 1 lb. weight attached to a cord of 60 fathoms into one of these sand-gulfs, which was about 2 miles long and nearly as broad, saw it sinking with diminishing velocity for about five minutes, when the end of the cord disappeared in the chasm.

5. *Oman and Hasa* are two provinces which together extend from Ras-el-Had up the Persian Gulf to the mouth of the Euphrates, and thus complete the Arabian sea coast. From Ras-el-Had the coast makes a concave bend to Ras-

Heiran, near which is the town of Muscat; and another concave bend extends from Ras Heiran to Cape or Ras Musendom. The Straits of Ormuz, between this cape and the coast of Persia, are about 32 miles wide at the narrowest part. The coast of Oman is generally low, backed by lofty chains of hills. Near Muscat rocks tower above the sea. Oman contains sandy districts, but is generally a fertile, well-cultivated tract, and its great advantages in this respect, together with a large degree of good government by its sultan, formerly known as the Imam of Muscat, has made Oman one of the strongest and most compact of Arab states. Between Ras-Musendom and Ras-Raccan the shore makes a great bend, forming the Gulf of Musendom, the shores of which are generally flat and lined with numerous islands and coral reefs. At a distance of 50 or 60 miles from the sea, and parallel with the crescent-shaped east coast, there runs a mountain range, the Jebel-Akhda, many portions of which attain from 6000 to 7000 feet altitude.

6. *El Hasa.*—Continuing northward, another bend forms the Gulf of Bahrein, in the middle of which lies the island of Bahrein, noted for pearl fisheries. From here to the mouth of the Euphrates there extends the Arab state

of Hassa, the low southward coast of which is enlivened by extensive green tracts of palm groves and of other semitropical vegetation. Towards the north, however, the aspect is more that of the desert. Theoretically El Hassa is an integral portion of the Turkish province of Basra, the chief town of which is a little north of the head of the Persian Gulf. Practically, it is subject only to the rule of Arab chiefs.

Nejd or Nejd. We now pass from the coast lands to the two great settled states of Central Arabia, Nejd and Shomar, or Shammār. Nejd, on the great central plateau, is an important region regarded by the Arabs as peculiarly their own—the stronghold of their vigorous nationality, and the birthplace of their most cherished traditions and institutions.

The chivalry, if we may so speak, the courteous dignity, and the abounding hospitality of the Arab race is nowhere met with so fully as in this inner country of the peninsula. Nejd has become known chiefly, however, in connection with the Wahabees, the Funitans of Mohammedanism. It is their own country, and from here they have exerted a vast influence upon the other parts of Arabia. They derive their name from the founder, Abdel Wahab, a Bedouin sheikh who, towards the close of the last century, having travelled extensively, declared that the faith of Islam had become corrupted in practice, assumed the character of a reference, and brought entire tribes, with their chiefs, to adopt his views. While believing in the divine mission of the prophet, they objected to pay religious veneration to him; deemed it specially sinful to honour the tombs of saints; denounced luxury in food and dress; forbade the use of spirituous liquors, smoking tobacco, and wearing silk; and proceeded to enforce this creed by the sword. Mecca was taken after a long siege in 1803; Medina fell in the following year; and nearly the whole of the peninsula was reduced. But the power of the Wahabees was broken by Mehmet Ali, the pasha of Egypt, whose army recovered the holy cities, and penetrated to Derayah, the then capital of Nejd, in 1819, which was nearly destroyed. Since that time Riad has been the capital. In recent years the influence of the Wahabees has much diminished, owing to the rise of the Shammār State, but even now they sometimes molest the caravans of pilgrims. In May, 1881, Mecca itself was pillaged by them, and the holy places, through this insecurity, suffered a large falling off in the visits of the faithful.

The central plateau of Nejd is bounded by ridges of hard rocks, and culminates in a crescent-shaped mountain range called Jebel Toweyk or "twisted mountain," the backbone of Central Arabia north of the tropic. This mountain has a mean elevation of 3000 feet, with peaks of superior height, is composed chiefly of chalk, but has a few granite crags on its south-eastern edge, where iron ore is also found. It is cut up by a perfect maze of valleys, which too often roaring torrents during the rains, but are dry at all other times; but everywhere, at all seasons, water is to be obtained at a depth of from 12 to 15 feet below the surface. In these valleys the people plant their towns and villages, for the shade and vegetation they afford.

Shammār.—North of Nejd, and separated from it by a narrow arm of the Nejd Desert, about 20 miles broad, lies the stony plateau of Jebel Shammār, a state allied to but not dependent on Nejd. Hayal, its capital, stands on the frontier between Basra and Medina, and there are about forty other towns and villages. Two ranges of mountains, Jebel Aja and Jebel Selma, cross this plateau in a South-North direction. Jebel Aja, composed largely of granite, is the northern rim of the whole table-land, and is 1000 to 1600 feet in height. In the neighbourhood of these hills, between Nejd and Shammār, there are

extensive fertile tracts, which are well clothed with the date-palm, shrubs, grass, and flowers; and to the existence of these oases, together with the very productive district of Yemen, it is due that only one-third of the whole peninsula is really sterile and uninhabitable desert, instead of about four-fifths of it as was formerly supposed.

The expression Nejd, or "High-land," at one time included the whole of Central Arabia; Shammār, the northern portion, being only one part of the vast area under Wahabi domination. But of late years Muhammed Ibn Rashid, emir of the Shammār nation, has not only asserted his independence, but is at present by far the most powerful potentate in Central Arabia. The beautifully fertile district of Jowf, and many other of the oases, pay him each an annual tribute of about £4. He further commands the new pilgrim road from Persia, which formerly passed southward through Riad, but now runs through Hail, or Hayal, capital of his dominions. This alone brings him in a revenue of £20,000 annually, besides giving him immense influence throughout the whole of the north from Mecca and Medina to the lower Euphrates valley. Though, however, since the decline of the Wahabi power, Ibn Rashid is the most powerful personage in the peninsula, he is content to pay a small annual tribute to the Sherif of Mecca, in recognition of the Sultan's suzerainty, such is still the potent influence of the acknowledged head of Islam. Ibn Rashid reached the throne over the murdered body of his young nephew Bender, and by the massacre of sixteen possible future pretenders; but he is said to govern his subjects wisely and firmly. Mr. Palgrave speaks of his rule as mild and just, and says that the *mejless* or public court of justice is still daily held in the palace yard, where the emir appears surrounded by officers of state and a body-guard of 800 soldiers. And Lady Anne Blunt, whose "Pilgrimage to Nejd" (London, 1882) is the most recent and able authority, tells us that "Taxation is light, service in the army voluntary, and Ibn Rashid's government eminently popular. Nowhere in Asia can be found a more prosperous, contented, and peaceable community than in Jebel Shammār."

Arabian Deserts.—The important settled countries of Central Arabia, Nejd and Jebel Shammār, are girded in on every side by a broad desert belt, which the traveller must of necessity cross before he reaches the inner region. It is this very desert that, having been often witnessed on its outer rim, but never traversed from one side to the other by Greek or Roman, or even in the greater number of instances by modern explorers, has given occasion to the belief that Central Arabia was itself little better than an expanse of uninhabitable waste—an idea expressed by the "Arabia Deserta" of the ancients, and so often repeated in modern times. The desert is of varying width and sterility, but always interrupted at intervals (sometimes very wide) by oases or slight depressions in its generally uniform surface, where a well or spring, surrounded by a few herbs and bushes, a little grass, and occasionally date-palms, enables the Bedouin to find the useful supply of fodder for his camels, and to lead the caravans of merchants or pilgrims across the trackless waste.

The northern desert, or *Nefood* ("sand-passes"), extends from the oasis of Teyma, on the borders of the Hejaz, across by the oasis of Jowf to the borders of Hassa, on the Persian Gulf. It is stony and gravelly, but mixed with reddish sand, which is heaped into ridges from 200 to 300 feet high, like a sea of red-hot waves. It is absolutely bare, save in the spring of the year, when it is thinly sprinkled with grass and herbs. In some parts a small herbaceous plant, called *samh*, grows wild, which produces a farinaceous seed, and yields the Bedouin his staple food supply. Over this desert the simoom blows

during the summer heats at uncertain intervals. There is no sand or dust in the atmosphere during the short period that the wind lasts, but the whole horizon becomes dark, as the stifling poison-blast, with the heat as of red-hot iron, passes over. To the west, along the borders of Hejaz, the desert is yet more irregular, and presses in towards the central high land between the mountain ridges in long finger-like projections; it cuts off the maritime provinces from all political influence with Nejd or Shanmar. In the northern desert the most remarkable oasis is that of *Jouf*, some 60 miles long by 10 or 12 broad, containing numerous villages. Each house stands in its own orchard, where the fig and the vine, the apricot and peach, and the choicest dates are cultivated, and where these fruits are not surpassed by the famous gardens of Damascus. The country lying to the north of the Nefood, between Arabia and Syria, is often referred to as the "Desert of Sinai," and in its stony barrenness amply deserves this name. It is, however, included in our remarks on Bahr-el-Tour Sinai. It includes the celebrated Petra, the rock-hewn capital of ancient Idumea.

The *Dahna* ("red desert") bounds the settled country to the east and south, and is the main sand-waste of Arabia. Between Nejd and the Persian Gulf it has been several times crossed by European travellers, but towards the south it is untracked, even by the Bedouin—an impenetrable waste of loose, red, intensely-heated sand, without water or vegetation of any kind, said to cover 50,000 square miles. These deserts lie on a plateau of some 1000 feet altitude, and are surrounded by a girdle of mountains, which rise on the eastern side to an average height of 1400 feet, and on the western side to considerably greater elevations. Beyond these lie the coast ranges and the ring of settled states round the borders of the peninsula.

Climate and Productions.—The low land of Arabia is occasionally, for many years, entirely destitute of rain; but sometimes it is scantily watered by the falling of slight showers during the months of March and April. The dews in the most arid tracts are copious. The high land has its regular rainy season, which begins about the middle of June, and continues till the end of September. Springs also abound in the loftier mountains, which, when fed by the copious annual rains, send torrents of water through the valleys that descend towards the coast; some of them are lost before they leave the mountainous region; others, which are more abundant, rush into the low land, where the fertility of the soil mainly depends on irrigation. Most of the larger streams, as soon as they enter the burning plains, spread out into shallow lakes, and are lost in the sand; only a few reach the sea. These temporary currents of rain-water and the small verdant valleys constitute an important and characteristic feature in the aspect of the country; they are called *wadis*, an expression which we frequently meet with, though variously written, as a component part of the names of rivers generally, on the maps of other countries also into which Arabian settlers have penetrated. The adopted Greek word *oasis*, or *oasis*, appears to be the same as *wadi*. Arabia is entirely destitute of navigable rivers.

In the coast lands the heat during summer, owing to the want of rain and the almost direct action of a tropical sun, is intense, the temperature varying from 80° to 102°. Most parts of the low lands of the coast have a bad and only too well-founded reputation for being unhealthy and feverish. Almost invariably, however, at distances of from 50 to 100 miles there rise the high lands, which extend away into the interior. In some cases the ascent leads up to deserts as arid and barren as the coast fringe itself, and with climate but little better, sometimes worse; but the upland districts, more particularly of Yemen, Oman, and a

few other parts, are labyrinths of hills and fertile copiously watered valleys, celebrated alike for the excellence of their fruits and the salubrity of their climate; the air is pure and even cool, and the seasons succeed each other in regular order. In the central country, too, throughout the high lands of Nejd and Shanmar, the climate, though often hot by day, is cool and pleasant at night; the spring and the autumn rains seldom fail in their seasons; and the soil produces excellent pasture, or, where irrigated, very tolerable garden produce and field crops. The prevailing winds, also the most refreshing, are from the east and north-east, and epidemic diseases are almost unknown. Across the Nefood or northern desert there occasionally blows the deadly simoom, but the other parts of Arabia are rarely troubled with this ominous visitor. The simoom, though sometimes confounded with the sirocco, is an entirely distinct phenomenon, and resembles in all essential points a cyclone, the central space itself being calm but occupied by a gas unfit for respiration. Round this poisonous nucleus as a centre, slowly travelling on, there eddy violent gusts of heated air, like those of a furnace, though it is not to them, but to the comparative vacuum which they surround, that the simoom owes its suffocating qualities. It approaches slowly and the whirl of air currents that precede it for some distance, its violet colour announcing when it is actually near. During its presence the only chance of preserving life till the mephitic vapour has passed over is found in covering the face with a cloth and lying prone on the sand, thus to inhale what little atmospheric air still exists in the upper ground stratum, and thus to maintain the breath till the period, varying from two to ten minutes, of the poison-column be gone by; meanwhile the feeling in the chest is that of suffocation, and that in the limbs as if molten iron were being poured over them. Camels instinctively bury their muzzles in the sand during the passage of the blast, but horses, not possessing the same preservative instinct, frequently perish. The course of the wind is generally from south or east to north and west, but the precise nature or origin of it is unknown.

Arabia has long been celebrated for the abundance of its odoriferous plants. The frankincense of Saba is alluded to by the prophets Isaiah and Jeremiah. Herodotus mentions frankincense, myrrh, cassia, cinnamon, and ladanum as productions exclusively peculiar to Arabia; and the best growths of these things are still those of the Yemen district. Among the Romans also Arabian odours seem to have been quite proverbial; but it is extremely likely that much that was supposed to be Arabian produce of this kind was the growth of India, brought *via* Arabia by merchants of the latter country.

The coffee-shrub is cultivated chiefly on the western descent of the chain of hills which, in the province of Yemen, separates the level country from the high land; that grown at Bulgosa, near Beit-el-Fakih, and exported from Mocha, still maintains its superiority over the coffee produced in all other parts of the globe. The farinaceous deposit called manna, familiar to all readers from the use made of it by the Israelites during their wanderings in the desert, is now chiefly, if not exclusively, found on the leaves of a species of oak called *ball'ot* or *afz*; some travellers say it is a pellucid substance exuded by the leaves of different kinds of trees, chiefly the *Hedysarum alhagi* of Linnaeus. Grapes are cultivated in several parts of Arabia, though in the Koran wine is forbidden to the Mussulmans. In Yemen, where some pains are bestowed upon agriculture, there is often seen excellent wheat, Turkey corn or maize, durra, barley, beans, lentils, tobacco, &c.; sesma and the cotton tree are also cultivated here. Much indigo is grown about Zebid. The time of the harvest varies. At Muscat wheat and barley are sown in December and reaped in March; in the high land, near

Sana, the time of the harvest for barley is about the middle of July.

Arabia is rich in indigenous trees; the *Acacia vera*, from which the gum-arabic is obtained, the date tree, and many varieties of the palm and fig tree deserve to be particularly noticed. Whilst coffee is the product of Arabia best known and most favoured by foreigners, the date-palm is considered by Arabs themselves as the tree of supreme importance, and as the special pride and ornament of their country—its fruits and the dishes made of it, by pressure or with butter, making it to the Arabs what corn is to northern or rice to southern nations. The great date-palm belt commences in the neighbourhood of Medina, crosses the peninsula and extends southward as far as lat. 20°. There are at least 100 varieties of the tree, and the quality of the fruit varies for each kind, as also do its size, colour, and flavour. Next is specially the land of date-palms; every valley that intersects its vast plateaus waves with them, and the fruit, which often attains a length of 2 inches, with a proportionate thickness, far surpasses the best products of any other part of Arabia in businness as in size. Eaten fresh or stewed with butter, they form the staple of Arab food; and the pulp, after the kernels have been extracted, pressed, and half dried, is exported under the name of *epoch* to almost every part of the East. Within the last few years another source of profit to Arab merchants has arisen in the sale of the dates, which, after being ground, &c., are pressed off as coffee or as one of its numerous and most wholesome substitutes. Forests are seldom met with in Arabia, and in the barren tracts of the country the Bedouins supply the deficiency of fuel by the dried dung of the camel.

Among the metals Arabia was celebrated for its wealth in precious metal; yet, according to the accounts of Arabian travellers, it possesses at present no mines other of gold or silver, and the probability is that Aduan obtained most of its precious metals from India. Iron is found in the Smadite peninsula, and black salt in portions of the coast-range. The lead mines of Oman are very productive, and large quantities of lead are exported from Muscat.

On the sands of Arabia and Syria the camel, the "ship of the desert," as it is emphatically called by the natives, is an invaluable creature. Some breeds of camels are famed for their beauty and swiftness, as those of Yemen and of Oman. They have not the month appearance or shagging gait common with their congeners, but carry their heads erect, throw out the legs with as much freedom and boldness as the horse, and their progress, at what appears their natural pace, cannot be less than 8 or 10 miles an hour. Like the Bedouins themselves the camel leans from early youth to endure hunger, thirst, and fatigue. It performs journeys of 300 to 400 hours without requiring to drink often or to rest more than once in eight or ten days. The herbage, scantily supplied by the desert, is sufficient for its food. It carries a weight of 1000 lbs. and upwards, without being unloaded for weeks. A hint from its leader directs its motions; a song renews its strength. Its hair is manufactured into cloth for garments and tents; its milk, like that of the cow, is nutritious and sweet; its flesh, when young, is in taste similar to veal.

Aduan is noted for its horses, of which there are two distinct breeds. The one, which is called *kadihi* (i.e. of unknown descent), is in no higher estimation than the common horse in Europe; horses of this breed are employed to carry loads or as draught animals. The other, called *Tobehi* or *kohlani* (i.e. of ancient and noble pedigree), is reserved for riding only. The best horses are those of Nejd and Schemer, where the breed is maintained and jealously guarded in its greatest purity; they are here

educated with a careful tenderness which trains them to habits of attachment to their masters. It is for this quality, for their wonderful capacity of enduring the hardships, thirst, &c., of the desert, and for their amazing speed that they are valued, more than for their size or beauty.

There is also in Arabia a spirited kind of ass, which is used for riding and for military service; the best are to be found in the province of Hassa. Many are a pure white, stand from 11 to 13 hands high, scarcely yield in pace to an average horse, and in the markets of Egypt or Constantinople fetch from £40 to £80 each. The Arabian oxen and cows are distinguished by a hump over the shoulders. Herodotus mentions two kinds of sheep with fat tails as being indigenous in Arabia. The rock-goat, the fox, the musk-deer, and a wild species of ass inhabit the hill-country. The jackal, the wolf, the hyæna, and the panther roam around the tents of the Bedouins, or follow the track of the caravans through the solitary desert. The gazelle seeks pasture and shade in the isolated *wadi*. The woods of Yemen and Aden are inhabited by troops of monkeys. The lion, from the frequent allusions to it in ancient Arabic poetry, and from the number of names which the language has for it, must at one period have been very common.

Among the birds indigenous in Arabia are some large kinds of prey, such as the eagle, the vulture, and several kinds of hawk. The carrion vulture performs the services of scavenger. The ostrich and other birds valued for their plumage live in the deserts. Tame fowls, pheasants, and different sorts of pigeons are frequent in Yemen. Along the coast of the Red Sea pelicans and various kinds of sea-fowl are found.

The locusts of Arabia, whose devastations are often terribly serious, are dried, and roasted or boiled, and in this state eaten by the Arabs, who thus make up to themselves to some extent the damage suffered by their crops and pastures. The people have also a habit of stringing the locusts on threads, and in this state they are offered for sale in the markets of all the Arabian towns from Bab-el-Mandeb to Basra.

The sea on the eastern coast of Oman is so abundant in fish that not only asses, cows, and other domestic animals are fed with them, but they are also spread on the fields as manure, to improve the soil. The pearl fisheries of the Persian Gulf are universally celebrated. The bank on which pearl shells are principally found extends from the Bahrein Islands to very near the promontory of Julfar. The northern extremity, near the isles Karak and Bahrein, is distinguished as particularly rich in pearls.

Inhabitants.—The best known division of the Arab race is that which separates them into "Ahl Bedoo" or "dwellers in the open land" (whence the common appellation of Bedouin), and "Ahl Hadr" or "dwellers in fixed localities." The former class, living under tents, and occupying the waste country which lies in a vast circle between the coast and the central plateau, while to the north it joins on to the Syrian desert, are the best known to European travellers, with whom they often come in contact. There is much misconception as to the character of the Bedouins, their name being widely regarded as synonymous with that of brigand. Professionally, however, and in the ordinary course of their lives, Bedouins are only shepherds and herdsmen (which is the literal meaning of their name), and their raids on each other, or their exploits in despoiling travellers and caravans, are but occasional, though exciting and even welcome exceptions to the common routine. The practice arises simply from the idea that the land is theirs, and that they have therefore a right to exact tribute from travellers who have no license of passage. If, however, permission be sought from the nearest Bedouin sheikh, he will, for a polite request and a small sum of money, grant a pass, and one or two of the tribe

will accompany the traveller as far as the next encampment on the road, handing him then over to fresh guides equally bound to afford the necessary safeguard. The rash traveller, however, who ventures on the desert without this precaution is likely enough to pay the penalty by the loss of his baggage, and should he resist, possibly his life also. That a considerable amount of rascality and plundering exists is doubtless the fact, and it prevails especially in the parts contiguous to districts claimed by the Turks, who at various times have vainly endeavoured to subdue these untamable wanderers. They regard the Turks consequently with an undying hatred, and avenge themselves upon everyone who comes from their direction without the necessary permission. As a matter of fact, however, so far from there being naturally anything savage or bloodthirsty about these roving Bedonins, the robbers are sometimes kind and even hospitable to the forlorn traveller whom they have plundered, furnishing him with provisions and old clothes in exchange for his own, and conducting him part of his way, that he may not perish in the desert. With all this, however, it must be said that the morals of Bedonin Arabs generally are of the most lax description, and their habits extremely degraded.

When it is remembered that the primary care of the Bedonins is their cattle, the wandering life led by some sections of these sons of the desert is better understood. The prolonged draughts of summer render considerable

portions of the country altogether unfit for pasturage, and thus continually oblige the herdsmen to migrate from one spot to another in search of sufficient herbage and water for their beasts. So far from being indiscriminate wanderers, there is perhaps no people less given to wander without special reason, or more attached to their homes, than the true Bedonins. Hence Arabic is almost the only language that has a perfect equivalent, in the term *watani*, to the English word *home*. The same urgent need for herbage and water also involves the Bedonins in frequent quarrels with each other regarding the use of some particular well or pasture, besides reducing them not unfrequently to extreme want, and giving them an urgent inducement to become plunderers of others in self-support. Add to this the loneliness of the desert, the entire absence of fixed law, order, police, or control of any kind, and it would seem strange if a bold, hardy, and enterprising race, with all these surroundings, generation after generation, had not somewhat of the ways of lawless marauders. With all the hardships of the desert, they value its freedom far higher than wealth and luxury, live in detached tribes under tents, and still adhere to the primitive form of government, habits, and usages of their ancestors. Their nobles they call *sheikhs*. A *sheikh* rules over his family and all its servants. If they are unable separately to defend their property against a hostile neighbour, several petty *sheikhs* unite and choose a chief from among themselves. The Bedonins are all, as



Arab Tents.

it were, born soldiers, while at the same time they attend to their cattle. The *sheikhs* of the great tribes have a large number of camels, partly for use in time of war, partly to transport the goods of merchants from one town to another, and partly for sale. The smaller tribes, which are less wealthy and independent, principally tend sheep. Agriculture is left to Arabs lowest in the social scale, who live in miserable huts; the *sheikhs* live under tents. Being accustomed to an atmosphere of great purity the sense of smell of these Arabs of the desert is very delicate. It is said that they are able to live for five days without drinking. The government remains in the family of every greater or smaller *sheikh*; among the sons or nearest relations, not the eldest, but he who appears the best fitted is chosen. They pay little or nothing in the way of taxes to their superiors. Every little *sheikh* is not only the protector, but also the leader of his family; he is, accordingly, looked upon by the greater *sheikh* rather as a confederate than as a subject.

The tents of the Bedonins are made of a coarse kind of dark-coloured cloth, woven by their own women, which is drawn over seven or nine poles fixed upright in the ground, the middlemost being the highest. The larger

tents consist of two or three compartments, so as to have separate rooms for the men and women, and for the domestic animals. The poor, who cannot afford the expense of a regular tent, spread a piece of cloth as large as they can get near a tree, or take shelter in the caves of rocks from heat or rain. There is but little furniture in a Bedonin tent: a mat of straw is used as table, chairs, and bedstead; spare clothes are kept in bags. The kitchen apparatus is very simple and portable. The pots are made of copper lined with tin, the dishes of the same metals or of wood. Their hearth is easily built; they merely place their cauldrons on loose stones, or over a pit dug in the ground. They have neither knives, forks, nor spoons. A round piece of leather serves them as table-cloth, in which the remains of the meal are preserved. Their butter, which the heat soon melts down, they keep in leather bottles. Water is kept in goats' skins; a copper cup, carefully tinned over, serves as a drinking vessel. Wind-mills and water-mills are unknown; all grain is ground in a small hand-mill. There are no ovens in the desert; the dough is either kneaded into a flat cake, and baked on a round iron plate, or it is formed into large lumps, which are laid between glowing coals till they are sufficiently baked.

Among the great sheikhs of the desert, who require pilau—*i.e.* boiled rice—for their meals, a large wooden dishful is served up, around which one party after another sits down till the dish is emptied, or all are satisfied.

The wild and somewhat romantic life of the Bedouins has given them an interest such as to lead to the idea that they constitute the majority of the Arabs. This, however, is by no means the case. Mr. Palgrave, one of the best modern authorities on the subject, estimates the population of Arabia at from 8,500,000 to 9,000,000, out of which the Bedouins number only 1,500,000. The "Ahl Hadr," or "dwellers in fixed abodes," consequently far outweigh the others in importance, and it is from a study of these rather than of their roving countrymen that a just appreciation of the Arab character and customs must be formed. The genuine Arab of the "Ahl Hadr" type is nature's gentleman—noble and handsome, of well-developed stature and healthy complexion, and distinguished by a great respect for authority, generous hospitality, and love of commercial enterprise. He is by birth and education a Mohammedan of the severest type; but scepticism and unbelief are as life in Arabia as in Christian countries, although not openly professed. The countries of Nejd and Shomer, in Central Arabia, are those in which the Arab race is met with in its greatest purity and in its finest characteristics. The clan and family form the basis of Arab civilized society; and every village, however small, and every separate quarter of a town, has its sheikh, or "emir," in whom is lodged the executive power of government; a judge, or interpreter of the law, sometimes takes precedence, but the power of the sheikh is pretty much according to the personal character and means of the individual who wields it. The "Emir," or ruler, a higher title is restricted to a governor of a district or province, part of whose office is duty to hold public audiences to receive complaints or petitions. He wears no distinctive badge of office, nor is he approached with any ceremony beyond ordinary Arab politeness. He frequently has the power of life and death, and in all cases that of imprisonment and fine. The title of "Sultan" or "Baum," adds little or nothing to the dignity of Emir, but implies a more terrible range of authority.

In their general habits Arabs are scrupulously polite and educated but little given to amusements. Seriousness reaches its height in Nejd and the places under Wahabee influence. In Yemen and Oman, coffee houses, where people can resort for conversation, and where public readings, songs, and other diversions are to be met with, stand out all day, but a tinge of the sort is tolerated in Nejd. The habits of life are here regulated in exact accordance with the Koran. Smoking, an indulgence highly prized in other parts of Arabia, is in Nejd strictly prohibited; ordinary conversation is interlarded with words of religious import; while after a late-prayers talking is an entirely forbidden luxury.

In person the Arabs are a remarkably handsome race—tall, fine, well formed, dark-haired, and dark-eyed—while darker or inferior persons are rare among them. Scrupulously clean in their persons, simple and abstemious in their habits, they often reach an extreme yet healthy old age. The towns, or even villages, are invariably walled round; the streets are irregular and tortuous, and though these are kept fairly clean, drainage is entirely neglected, only the extreme dryness of the air preventing the inconvenience and disease that would otherwise ensue. Negro slavery is a domestic institution, the slaves being usually employed as household or domestic servants. They readily embrace the religion of their masters, Arab custom enfranchising a slave who has accepted Islam at the end of seven years of bondage. The slave not only becomes free without payment, but generally receives from his master a present of

the means of supporting himself and a family in comfort. Inter-marriage with negroes is common, there being no social prejudices whatever against such alliances; and a negro may become a sheikh, an emir, or whatever he may prove his capacity for.

Education in Arabia, as may be naturally supposed, is of the scantiest kind. There are no schools whatever among the Bedouins, who, utterly ignorant of writing and unacquainted with books, trust to their memory for everything, and where memory fails their facile imagination comes largely into play. In the towns and villages a school is found here and there, but in the highest class writing, grammar, and rhetoric sum up its teachings. Law and theology are explained in the mosques, and the good manners, politeness, and self-restraint which early distinguish Arab children are due to the schooling at home, where more is learned from parents than is common in most countries. Accuracy of grammar and purity of diction come in for a large share of attention, and Arabic, with a slight dialectic difference in different districts, is spoken with much elegance throughout Arabia.

A very interesting work on Central and Eastern Arabia was published in London in 1865. It was written by Mr. W. G. Palgrave, who in the guise of a Christian physician of Damascus, travelled from Gaza, by Maan and the Jowf, to Haïl, the chief city of the Jebel Shomer, or Shanmar, and thence to Riddh, the capital of the Wahabee kingdom, where he remained for seven weeks in constant intercourse with the king, the nobles, and other people of the place. He afterwards proceeded to Oman, the dominion of the prince usually called the Imam of Muscat. Here also he remained for a considerable time, and at length returned to Bagdad. His journey occupied in all nearly eleven months; the route and the places visited were of great interest, though previously almost unknown to the western world; whilst the author's intimate knowledge of Arabia, with the opportunities of studying all classes of men which the possession of medicine gave him, rendered his narrative unusually vivid and precise. The more recent narrative of Lady Anna Blunt (London, 1882), who, with Mr. Blunt, performed much the same tour without any disguise, has given us many interesting particulars respecting the Jebel Shomer tribes, who have of late years risen to great influence and power.

History.—The name of *Arabia*, by which the Greeks introduced this country to the knowledge of Europeans, is derived from the name which the Arabs have from a remote period applied to themselves; but the etymology of the word is not clearly settled. In the Bible, the terms Arabia and Arabs appear to apply only to small territories or isolated tribes in the northern part of what is now called Arabia.

The wandering tribes of Arabia seem to have been known from the earliest period of authentic history. The Midianites of Scripture occupied the northern part of Arabia; but these seem to have been rather Arabs of towns than Bedouin Arabs; and indeed Arabia was celebrated for its commerce in Scriptural times, both for its own productions, and as an intermediate station in the trade with the East. Ophir, whence the ships of Solomon brought gold and other commodities, is believed by many writers to have been in Arabia. Antiquity abounds in proofs of the early trade of the Phœnicians with India, which must in a great measure have been carried on through Arabia. One of the earliest and most important allusions to this mercantile intercourse of the Phœnicians with several towns or countries and tribes of Arabia, occurs in the elegy of the prophet Ezekiel on the fall of Tyre (*Ezek. xxvii.*)

The intrepid valour of the Arabs was proverbial among the Greeks and Romans. The body of the nation has escaped the dominion of the most powerful monarchies that

have arisen and fallen in its immediate neighbourhood. Of the ancient Persian empire, Herodotus expressly mentions that all nations of (western) Asia were subject to Darius Hytaspes, except the Arabs, who were the independent confederates of the Persians; and when Cambyases had formed the design of invading Egypt he was obliged to seek the friendship of some Arabs, who engaged to supply the Persian army with water during its march through the sands of Arabia Petraea.

Alexander the Great is said to have contemplated the circumnavigation of Arabia and the subjection of its predatory hordes. The fleet of Nearchus was preparing to make the circuit of the peninsula, when the death of Alexander prevented the execution of the design.

The Nabathari ("Nebaioth," Gen. xxv. 13; xxviii. 9; Isa. lx. 7) inhabited, according to Diodorus (ii. 48), the north-eastern part of Arabia, which was subsequently, in allusion to the name of their capital Petra, called Arabia Petraea. Diodorus describes them as a valiant nation, safe in their deserts as in an asylum, where none but themselves knew the springs of water. Like other Bedouin tribes, they subsisted in a great measure by predatory excursions; but they seem at an earlier age than their neighbours to have applied themselves to an independent traffic, and in consequence also to other occupations of peace. From the time of Alexander till that of Trajan, Arabia Petraea was subjected to many invasions; and it at length fell under the Roman power in A.D. 107.

Of the internal history of Arabia before Mohammed, our knowledge is very imperfect. Prior to the beginning of the third century of the Christian era, all that has been transmitted to us by Arabic writers amounts only to some genealogies or lists of kings, without any fixed chronology, and interspersed with but a few facts unsatisfactorily recorded.

The fountain Zemzem and the black stone in the ancient temple of Mecca, called the Kaaba, had from immemorial time been regarded by the Arabs as national sanctuaries; and many of the Arabic annals and legends prior to the time of Mohammed relate to contests respecting the possession and protectorship of these sanctuaries; for this gave a kind of chieftainship over the other tribes. In A.D. 464 this guardianship was in the hands of the tribe of Koreish. About the close of that century many tribes of Arabia had embraced Judaism, while others had embraced Christianity; and contests between them did much towards paving the way for Mohammed's career.

The Arabs before Mohammed, like those of the present day, partly dwelt in cities, and partly as wandering tribes in movable encampments. The inhabitants of cities subsisted by agriculture and by different trades, especially by commerce, in which the tribe of Koreish appears early to have distinguished itself. The wandering Arabs employed themselves in the breeding and tending of cattle, and occasionally in the pillage of travellers. The picture exhibited by ancient poets (especially in the romance "Antar" by Asmai) of their customs and mode of life, entirely corresponds with the representation which modern travellers make of the manners of the present Bedouins.

With respect to the religion of the ancient Arabs, our information is very imperfect. As they were ranging their deserts beneath unclouded skies, they seem to have been early led to the worship of the heavenly luminaries. Various deities were also worshipped in the human and the brute forms. Among the tribes of Temim, on the Persian Gulf, the Persian fire-worship is said to have been introduced. The idea of goblins and fairies, some of a terrific, some of a mild and placid character, was early associated with the loneliness of the deserts. Fortune-telling, necromancy, astrology, and sorcery were early at home in Arabia.

The Arabs, before the time of Mohammed, had never

been united by a common tie into one mass; but that extraordinary man succeeded in forming them into a nation by giving them a common religion. Mohammed was born at Mecca in A.D. 570; and at forty years of age he commenced that system of action which led to the foundation of Mohammedanism. Not only were the tribes of Arabia weakened by internal discord at that time, but the Byzantine and Persian empires were also at a low ebb from various causes; so that everything conspired to favour the rise of such a powerful and energetic man as Mohammed.

Mohammed founded a caliphate which in one century included Arabia, Syria, Mesopotamia, Egypt, Barbary, Persia, and Khorassan. At later periods India and many parts of Asia, the remaining portions of North Africa, and Spain were brought under the dominion of the caliphs. This singular nation, in fact, itself never conquered, had, during the seventh and eighth centuries, overrun and subdued half the then known world. The secret of her conquests, however, lay not in the number of her warriors, but in a resolute purpose, a unity of aim, and an enthusiasm which concentrated in itself and intensified every motive of human action. The seat of empire was several times removed; but Arabia still contained the two sacred cities to which the eyes of all Mohammedans were directed.

The caliphs of the Omniad family retained power from A.D. 670 till 750, the seat of empire being at Damascus. The caliphs of the Abbasside family reigned from 749 till 1528, with Bagdad as their capital. From the immense size of the empire thus formed, Arabia became only one and even a minor part of the whole. After the removal of the seat of government to Damascus and then to Bagdad, the country of Arabia relapsed into its former insignificance; it became in name, though not in fact, a mere province of the Mohammedan empire, and was soon again divided into small domains. Except the monotonous enumeration of the annual procession of pilgrims to the sacred city, the mutual conflicts among the Bedouin chiefs, the rise of the Wahabite power in the Nejd, and the strong rival influence attained by the Arabs of Shamer, the recent history of Arabia generally offers little of sufficient interest to fix the attention of the general historian.

After the conquest of Syria, Persia, Mauritania (corresponding to the present countries of Morocco and Algeria), and Spain, the trade of the Arabs became of great importance. Islam favoured the establishment of emporia, and the wide dominion of one religion and one language rendered travels and mercantile transactions easy. The luxury of the court of Bagdad, and the magnificence of the Abbasside caliphate, caused frequent travels of merchants into India. After the ninth century of our era Arabs began to settle in various parts of India, and several Indian princes embraced the Mohammedan faith. The Arabs soon penetrated to the Indian Islands, Ceylon, Sumatra, Java, Celebes, and even to China. Arabian caravans proceeded over land as far as Tartary and Siberia in the north; in Africa they came to the Niger, where, since the tenth century, the Mohammedan states of Ghana, Wangara, Tokru, Kuku, and afterwards those of Senaar, Darfur, Bornou, Timbuktu, and Melli, were founded. On the coasts of Africa they came through the Straits of Bab-el-Mandeb to Zanzibar, established the harbours of Makdashua, Melinde, Sofala, Kulu, and Mozambique, and went over to Madagascar. Few other families of mankind have, at one period or another of their history, occupied such wide geographical areas. They impressed, moreover, their peculiar institutions on the people conquered, and gave forward impulses wherever they obtained a sure footing.

Language.—Arabic forms, with Ethiopic, the southern ramification of the great stock of languages which is very commonly, though improperly, called Semitic; the

other two principal branches are—1, the Aramaic branch, which comprises the Syriac and Chaldean languages; and 2, Hebrew. Of Hebrew, we possess the earliest written documents. About the time when it ceased to be a living language, Chaldean makes its appearance. Whatever we possess in Syriac is of a still more recent date. The literature of Arabic does not reach far back beyond the age of Mohammed. At present most of these Semitic languages are extinct, or survive only in small districts. Arabic alone has outlived all its sister-tongues, and has spread not only as the vernacular tongue all over Syria, Egypt, and Northern Africa, but also as the language of religion throughout Persia, the Turkish empire, and all countries into which the Mohammedan faith has been introduced.

Various dialects prevailed among the Arabian tribes previous to the age of Mohammed, among which that of the tribe of Koreish has through the Koran become the classical tongue. Mr. Palgrave observes that Arabic is at present spoken with the greatest purity in the districts of Nejd and Shamer, which are the parts of the peninsula having least communication with the outside world. The Arabic language is rich not only in words (especially in such as refer to natural objects and to the life of a nomadic people), but also in grammatical inflections, particularly in the verb, where certain general modifications of the meaning are briefly and energetically expressed by slight changes in the form of the roots.

Literature.—The Arabs do not possess any authentic literary relics anterior to the sixth century of our era, and the poems called "Moullakat" all belong to that or the beginning of the next century. At the time when they were composed, the language and the poetry of the Arabs had already attained a high degree of cultivation. Assemblies were held, the country being at Okadh, in Yemen, where poets from all parts of Arabia contended for a prize by reciting their compositions; the poems of the successful competitors were transcribed, written in letters of gold, and hung upon the Column, where they were named *moullakat*, that is, the suspended.

Mohammed received much learning and poetry, and the refined and often truly sublime diction of the Koran attests that he himself was no stranger to the powers of poetic language. Yet during the first century after his death, in the reign of the weak Omniads, the voice of poetry was silenced in the name of war. But literature flourished under the earlier Abbassid caliphs, and this is the period in which Asiri wrote the romance of "Antur." Of the well-known "Arabian Nights" which give so lively a representation of the state of society in Arabian towns, the period is still disputed.

Al-Mansur, the second of the Abbassid caliphs, was the first who distinguished himself by his zeal for literature, expending the state funds on the law, astronomy, mathematics, and philosophy. The Christian physician George Bakhtishan, son of the first, directed the attention of the Arabs to Greek and Syrian literature. Haroun-d-Raschid called George to his court, and Bakhtishan has a court, who then lived in N. Calicut, a famous Greek and Syriac words to be translated to Arabic, and established colleges in the

368 names of the empire. In the reign of Marwan the son of the Arab saw the birth of the "The works of Aristotle, Hippocrates, Galen, Dioscorides, and Theophrastus, of Euclid, Archimedes, and Ptolemy were translated into Arabic partly from the Greek originals, and partly from the Sanscrit language. At the command of Marwan, Mohammed ben Musa, of Khwarezm, wrote the first century treatise on Algebra, evidently derived from a treatise of proportion from Indian sources. Marwan founded a college at Basrah, Bagdad, Cufa, and Bokhara, and furnished scholars with the necessary means to visit foreign countries for literary purposes. In his reign Yahya

ben Abi'l-Mansur built and superintended observatories at Bagdad and Damascus.

In the subsequent times of the caliphate, the emirs Al Omara and the Bawallide (Buide) sultans encouraged literature; in almost all the dynasties which sprung out of the caliphate there were some sovereigns at least who loved the sciences and patronized scholars. The dynasty of the Fatimides in Egypt is in this respect distinguished. Ibrahim ben Aglab, the founder of the Aglabide dynasty, made Kairwan a seat of learning; and Zeiri encouraged literature in the town of Afshir, which he had founded in the territory of the present Algiers.

In Spain the Omniad caliphs followed the example of Al-Mansur and his successors. An exchange of learned ambassadors took place between Abdurrahman III. (912-961) and the German emperor, Otto I. His son Hakem founded the university of Cordova, and many colleges and libraries in Spain; his own library is said to have contained not less than 600,000 volumes. Gerbert of Anrillac, who afterwards ascended the papal throne as Sylvester II., studied at Cordova, and introduced into Europe the Arabic decimal system, for which the Arabs were said to be indebted to the Hindus. [See ARITHMETIC.] Several English scholars, Adelard or Adhelard of Bath, in the eleventh, and Robert and Daniel Mokey in the twelfth century, also visited the Arabic universities of Spain. It was through Spain, and through the Arabic versions, that the attention of the Schoolmen was first drawn to the writings of Aristotle. The conquest of Algiers has caused increased attention to be given to the study of Arabic in France, and several French works on the subject have appeared.

ARABIAN NIGHTS' ENTERTAINMENTS, or 1001 Nights, a famous collection of Eastern tales, first made known in Europe by M. Galland, who translated them into French in 1704. They have been translated into almost every European language, and have everywhere become very popular. This is due, less to the talent of the narrator, than to the expression of the genius of the East—to the faithful picture it offers of the manners and customs of the Arabs. Here we find eternally enshrined a perfect representation of the mind, the character, the life, and habits of a people once powerful enough to carry its civilization and its conquests into three of the great divisions of the globe. The tales are supposed to be told in snatches, in the hour before daybreak, during 1001 nights, by the Sultana Scheherazade, to keep in good humour her lord, the Sultan Shahriar. We learn from the Arabian historian Masoudi, who wrote in the year 333 of the Hegira (A.D. 944), that the collection, even then called the "Thousand Tales," was translated from the Indian, the Persian, and the Greek; and in the same passage he speaks of other famous collections, "such as the *Voyages of Sindbad*, and the other works of that kind." Thus we see that this famous tale at that time did not form part of the "Arabian Nights," of which it is now one of the most admired portions. We trace many of the tales to the Indian "Fables of Pilpay;" we find also many Greek (some Homeric) myths amongst them, and it is easy to see how, on the slender thread we have mentioned, story after story came to be strung from the first translation and compilation under the Caliph Mansour (A.D. 754) down to times much nearer our own. The subsequent popular Caliph Haroun-al-Raschid (A.D. 786-809) was afterwards made the hero of many of the tales, which admirably suited with his love of romance and adventure. Subsequent caliphs of the Abbassid and Omniad dynasties have been also made to figure in some of the histories. Thus it is not to be wondered at that the dozen or so MSS. are all fairly complete, but no two are alike either

as to the tales or their division into "nights," yet all contain the principal episodes, and all are of course carefully divided into 1001 snatches.

The best English translation is that by Mr. W. E. Lane, which first appeared in 1839, and has since been reprinted over and over again.

ARABIAN SEA, a name applied to the extensive portion of the Indian Ocean which lies to the N. of a line drawn on the map from Cape Guardafui in Africa to Cape Comorin in Hindustan. It has several large ramifications and inlets. The Gulf of Aden connects it with the Red Sea, and by means of the Suez Canal forms the great highway to our Indian possessions. There are also the Gulf of Oman, leading to the Persian Gulf, and the Gulfs of Cutch and Cambay. The ancient name of the Arabian Sea was *Mare Erythreum*, or the Red Sea. The first well-authenticated voyage of any extent, for purposes of exploration, was made along its northern shores by Nearchus, the admiral of Alexander of Macedon. From Bombay to Aden it has a stretch of about 1800 miles. The only islands of importance are Socotra and the Laccadives.

AR'ABLE LAND. See AGRICULTURE.

ARACAN', the most northerly of the three divisions or provinces of British Burmah, lies on the eastern shore of the Bay of Bengal. Its length is about 230 miles, average breadth about 50 miles, gradually diminishing from 90 miles in the N. as it proceeds southwards, and its area 18,530 square miles.

It is bounded on the E. by the Aracan Yoma Mountains, which separate it from the kingdom of Burmah, with which it has communication by various passes, the easiest being the Aeng route; and on the N. it extends to Chittagong, a district of Bengal. The S. boundary, which was formerly Cape Negrais, is now the river Khwa, the lower portion of the territory having been in 1852 united to Bassein district. There are numerous islands on the coast, the more important of which are Cheduba, Ramree, and Shalpur. Aracan is administered by a commissioner, whose headquarters are at Akyah.

This country, over which the Portuguese had formerly a temporary ascendancy during the time of their conquest in Asia, was in 1826 acquired by the East India Company from the Burmese, having been conquered by that people in 1784, before which it was an independent kingdom. It contains the Aracan Hill Tracts or Northern Aracan, Akyah, Kyauk-hpyu, and Sandoway.

The fertility of this country is very great, and its soil fit for the culture of nearly all tropical productions; but in the actual state of agriculture rice only is grown to any great extent. Indigo, cotton, and tobacco, as well as hemp, are also raised. Among other plants cultivated are the sesamum, mustard, sugar-cane, pepper, numerous fruits, and oak and teak timber trees. The animals comprise tigers, wild elephants, buffaloes, poultry, and an abundance of fish. Salt, iron, naphtha, and coal are among the mineral products, and small quantities of gold and silver have been found. There is steam communication between the ports of Akyah, Kyauk-hpyu, Sandoway, and Calcutta.

The aborigines are of Burmese origin, though they have a dialect and customs of their own. They are designated *Mugs* by the inhabitants of Bengal, but their national name is *Yakain* or *Ma-ran-ma*. They are short and robust, and in features resemble the Aryans as much as the Mongolians. Females are secluded, and early marriages of girls are frequent. Education is widely prevalent. The number of the inhabitants is 500,000, almost all of whom are Buddhists. The condition of the country has been greatly improved since it came into the possession of the British; the bands of robbers by which it was infested have been

extirpated, and tranquillity and commerce now exercise their beneficial sway.

The **ARACAN HILL TRACTS**, a district in the above division, with an area of 4000 to 5000 square miles, are composed of parallel ridges of sandstone, clothed with thick forest, and drained by numerous streams, the chief of which is the river Koladyne or Aracan, navigable for vessels of 400 tons for 40 miles. The hill races consist of various tribes, the principal of whom are the Khamies, a wary and somewhat deceitful people, but always faithful to those whose fidelity they have proved. Of all the tribes they are most open to improvement, and recognize the advantages of peace and trade. A very ancient system of criminal and civil law exists, and trial by ordeal is resorted to. Women cannot inherit property and are not liable for debts. These tracts were taken from the jurisdiction of Akyah in 1865, and made into a separate district. Agriculture is carried on in a very primitive manner. Cotton, sesamum, and tobacco are the staple products, but in this district little rice is grown. The only manufactures are weaving of cotton cloth and basketmaking. Fevers are very prevalent, more especially during April, May, and June, but the unhealthiness of the climate is said to have been overstated.

ARACAN, now called Mro-houng, meaning "old town," is the ancient capital of the province, and is built on a plain entirely surrounded by hills, and intersected by several streamlets. One of these—a branch of the Koladyne river—runs through the town and divides it into two parts connected by strong but clumsy wooden bridges. During the periodical rains the greater part of the town is inundated; and on this account here, as well as in the villages on the plain, the houses are raised upon piles or strong posts of timber, little more than 4 feet above the ground, that the water may have a free course under them. These houses, or rather huts, are miserable structures, only one story high, and thatched with straw or mats. This town is about 4 miles in circumference, and of a quadrangular form. Before its occupation by the British troops (in 1824) it is said to have contained 13,000 houses and 95,000 inhabitants. Now the latter number is only 3000, and the place has lost all its former importance. It was once a famous seat of Buddhism, and appears to have been known to Ptolemy.

A'RACHIS, in botany, the generic name of a kind of pulse called the earth-nut. It was originally a native of the West Indies and West Africa, but is now much cultivated in the warmer parts of the world. It belongs to the *LEGUMINOSÆ* or pea family. The seeds are considered a valuable article of food in Africa and the tropical parts of Asia and America. In flavour they are as sweet as an almond; and they yield, when pressed, an oil in no respect inferior to that of olives. The plant will only grow in a light sandy soil, in which its pods can readily be buried, and it requires a climate as hot at least as that of the south of France. Its stems grow from 1 to 2 feet high; its leaves are composed of four broad and blunt leaflets; and its flowers have an immensely long, two-lipped calyx, a small yellow corolla, and eight united stamens. When the flower has fallen the ovary is raised 2 or 3 inches by the growth of a stalk, which curves downwards, and at last pushes the ovary into the ground. If the ovary is successfully buried it ripens into a wrinkled yellowish pod with two seeds.

ARACH'NIDA (SPIDERS, SCORPIONS, and MITES) form a class belonging to the subkingdom *ARTHROPODA*. The body is made up of a string of joints (*conites*) generally so united as to form two well-defined parts, the cephalo-thorax (*i. e.* head and chest together) and the abdomen. There are no antennæ, and the eyes are simple, not compound as in insects. The thorax has four pairs of

jointed legs, but the abdomen has no locomotive limbs, though it is often provided with appendages (spinnerets). Except in the lower Arachnida, in which there is a very incomplete change, there is nothing corresponding with the larval and chrysalis conditions which occur in insects. The mouth has two "falces," working horizontally from side to side, and used for seizing and holding the prey; a pair of "maxillæ," each provided with a maxillary "palpus" of four or five joints; and a lower lip or "labium." The skin is more or less hardened, forming, as it were, an external skeleton; and the muscles are attached to it (instead of being affixed to bones) and to the inside of the hollow limbs. In the higher forms the circulation is carried on by means of an elongated "heart," placed along the back of the abdomen. This vessel is furnished with valves for the vital fluid to pass in, and with arteries for its distribution to the various parts. In the lower forms both circulatory vessel and arteries are wanting, and the vital fluid is distributed by means of muscular contractions of the intestine. The breathing organs vary in the different groups. Some of the lowest kinds have the blood oxygenated over the whole surface of the body. In others the apparatus is similar to that of insects; there are holes (stigmata) in the skin, situated generally on the abdomen, and from these proceed very fine air-tubes (tracheæ), branching in various directions, following the course of the bloodvessels, and carrying the air to the blood, thus reversing the process which obtains in the Vertebrata. In others again, where the bloodvessels expand, holding a much larger quantity of blood, there are air-chambers (the so-called pulmo-branchiæ) in which are found from sixty to seventy pouch-like leaflets. The blood does not penetrate these leaflets, and therefore, in the opinion of the best authorities, these air-chambers are neither gills nor lungs, but are in the nature of more highly-developed air-tubes. The group of spiders possess both air-tubes and air-chambers. The digestive process is carried on in a straight intestinal tube, which sometimes has short branches. Salivary glands are also sometimes present, as well as organs acting as liver and kidneys. The nervous system is formed, at any rate in the embryo, like the typical ARACHNIDA. There are two cords of nerve-fibres running down the body, with nerve-knots (ganglia) in each of the "somites." The pairs of nerve-knots are united by nerve-fibres, and there is a collar of nerves passing round the gullet in the fore part of the body. But this typical arrangement is more or less obscured in the perfect state; e.g. in the spiders there are two nerve-knots in the cephalo-thorax—one towards the head, sending out nerves to the eyes, &c.; the other in the thorax; and there is frequently another small nerve-knot in the abdomen. In the mites, on the other hand, there is a single nerve-knot situated in the abdomen, with nerves from it to other parts.

There are nine orders of Arachnida:—1, SCORPIONS (Scorpionea), in which the respiration is by air-chambers, and there is a post-abdomen ending in a claw (see Plate ARACHNIDA, fig. 1); 2, CHELIFERIDEA, in which the respiration is by tracheæ, the abdomen is not distinctly separated, and the maxillary palpi have two claws (fig. 2); 3, ACARIDEA, with unsegmented abdomen, which is united to the cephalo-thorax (figs. 3-7); 4, SPIDERS (Araneida), in which the unsegmented abdomen is distinct from the cephalo-thorax (figs. 8-12); 5, HARVEST-SPIDERS (Phalangidea), in which the respiration is by tracheæ, the abdomen is not distinctly separated from the cephalo-thorax, and the maxillary palpi have only one claw; 6, PIRENYIDEA, in which respiration is by air-chambers and there is no post-abdomen (fig. 13); 7, SOLEIFEROA, in which the respiration is by tracheæ, and the abdomen is separated from the cephalo-thorax; 8,

WATER-BEARS (Aretisca), which have a vermiform body, with four pairs of rudimentary limbs; 9, PENTASTOMIDEA, which have a vermiform body, the embryos only with two pairs of rudimentary limbs.

ARAD, OLD, a city of Hungary, and capital of the country of the same name, on the right bank of the Maros, a tributary of the Theiss, 59 miles E.S.E. of Szegedin, and 145 miles S.E. of Pesth. It possesses a strong citadel, is the see of a Greek bishop, carries on a large trade in tobacco and corn, and is one of the most important cattle-markets in Hungary. In the insurrection of 1849 Arad was a place of great importance, and from it Kossuth issued his famous proclamation declaring the hopelessness of the Hungarian cause. It was subsequently surrendered to the Russians by Görgey. The inhabitants, many of whom are Jews, number 34,000.

NEW ARAD, on the opposite bank of the river, has a population of 5000, comprising many Germans. It was fortified by Prince Eugene of Savoy, and is one of the strongest military posts in Austria.

AR'AFAT is the name of a hill near Mecca, where, according to the belief of the Mohammedans, Adam, conducted by the angel Gabriel, met Eve, after they had been separated for 200 years, in consequence of their disobedience and banishment from Paradise. It is the scene of an annual procession of the Mohammedans to the present day, at which certain prescribed ceremonies are performed; and no pilgrim, although he may have visited all the holy places of Mecca, is entitled to the name of *haji* unless he has been present on this occasion. More than 100,000 persons have frequently been there at a time, and between forty and fifty different languages may be heard.

AR'AGO, FRANÇOIS JEAN DOMINIQUE, a celebrated French physicist and astronomer, was born at Estagel, near Perpignan, 26th February, 1786. Against the wish of his parents he decided in early life to enter the army, and was accordingly sent to the municipal college of Perpignan, to prepare for the Polytechnic School of Paris. Here he devoted himself with eager avidity to the study of mathematics, and made such quick progress that he soon found he had got beyond his teacher; but, nothing daunted, he procured the works of Euler, Lagrange, and Laplace from Paris and studied them in private. At the age of seventeen he entered the Polytechnic School, where, at the preliminary examinations, he astounded the *sucants* Monge and Legendre by the extent of his knowledge of mathematics. He passed through the school with the greatest distinction, and in 1804 received the valuable appointment of secretary to the Observatory at Paris, where he was brought into contact with some of the most eminent philosophers of France. In 1806 he was appointed, with his friend Biot and two Spanish commissioners (Chaix and Rodriguez), to carry out the measurement of an arc of the meridian between the parallels of Dunkirk and Barcelona, which had been begun by Delambre and Mechain. The French observers established themselves in a hut on the summit of Mount Galatza, one of the loftiest of the Catalonian Pyrenees, from which they communicated by signals with their Spanish colleagues, who had encamped on Mount Campecey, in the little island of Ivica. Before the calculations could be completed war had broken out between France and Spain, and the ignorant populace imagining that the goodetic signals made by Arago were made to the generals of the French armies, he was compelled to imprison himself in the citadel of Belver. From this place, after narrowly escaping death by poison at the hands of a priest, he escaped to Algiers, where he was befriended by the dey. Embarking for France in an Algerine vessel he reached the Gulf of Lyons, when it was captured by a Spanish corsair, and he was carried with the crew to Rosas, from whence he was sent to the hulks at Palamos. After enduring con-

elderable privations he was successfully reclaimed by the friendly Dey of Algiers, and once more set out for France. The vessel in which he had embarked brought him in sight of the shores of France, when it was overtaken by a storm and driven back to Algiers. Here he found that while on the voyage the dey had been beheaded and a ferocious tyrant had taken his place, who placed Arago on his list of slaves, and detained him six months to act as interpreter.

Released at the request of the French consul, he again embarked, and landed at Marseilles on the 2nd July, 1809, after an absence of three years. He had succeeded throughout all his adventures in keeping his instruments, charts, and manuscripts uninjured, and his first act on reaching France was to deposit them in the Bureau de Longitude at Paris.

As a reward for the labours and sufferings thus undergone on behalf of science he was elected, though only twenty-three years old, a member of the Academy of Sciences, and received the appointment of professor of analytical mathematics in the Polytechnic School. About the same time he was also appointed one of the astronomers of the Royal Observatory.

In 1811 he directed his attention to the polarization of light, and in a paper read before the Academy he laid the foundation of that branch of physical optics known as chromatic polarization. The following year he commenced a course of popular lectures on astronomy, which were continued until 1845, and were attended with the most astonishing success. Rigidly accurate as to the facts of science, they were rendered intelligible and interesting to the immense audiences which assembled, by the eloquence, brilliancy, and transparent clearness of the lecturer. In 1820 he was employed by the government to make, in connection with Dulong, a series of experiments on the elastic force of steam, a task attended with no little difficulty and danger, which the two philosophers accomplished with great ability and success. About the same period he made the important discovery of what is called "rotatory magnetism," which excited great attention at the time, and for which he was awarded the Copley Medal of the Royal Society of London in 1825. In 1830 he received the highest honour that the science of France could bestow, in the appointment of perpetual secretary to the Academy of Sciences—an office which he filled with the greatest distinction to the time of his death. The same year he was also appointed to the chief direction of the Paris Observatory, and he obtained a grant of money from the government for the purchase of new instruments, which enabled it to take the high place it has since retained. From this time up to 1848 his life was devoted to the scientific labour connected with the Academy and Observatory, and to the publication of a multitude of papers on almost every department of physical science. As secretary to the Academy it became his duty to write the "Éloges," or sketches of the character and labours of the deceased members, which being enriched with contributions from his vast stores of knowledge, couched in a discriminating and yet generous spirit, and composed in a style of exquisite beauty, have given him a high place among the writers of French prose. He was called from these peaceful labours by the revolution which resulted in the fall of Louis Philippe in 1848. Arago had always been a keen republican in politics, and his popularity was so great that the provisional government made him minister of war and of marine. His ideal of a republic was that of the United States, and he steadfastly resisted the measures proposed by the Socialists; and during the insurrection of June, 1848, made such earnest efforts to stop the outrages of the mob that he narrowly escaped with his life.

On the accession of Napoleon, after the *coup d'état* of 1852, Arago firmly refused to take the oath of allegiance demanded of all the functionaries of the empire. The

emperor replied by a letter in which, after passing a high eulogium on his ability and integrity of character, he made "an exception in favour of a savant whose works had thrown lustre on France." Arago, however, was now in failing health, and after a lingering illness he died at Paris, 3rd October, 1853, at the age of sixty-seven. He was honoured by the imperial government with a public funeral.

His discoveries in connection with astronomy, magnetism, galvanism, and optics are too numerous to be described here, but they have for ever associated his name with the history of these sciences. In private life he was of simple and frugal habits, and though impetuous at times was ever kind, sociable, and attached to his friends. A fine edition of his works, in seventeen volumes, was published at Paris (1855-60). Several of his works have been translated into English, among which may be mentioned his "Popular Lectures on Astronomy" (London, 1851), his "Autobiography" (London, 1855-58), and his "Biographies of Men of Science" (London, 1857).

AR'AGON or **ARRAGON**, one of the ancient provinces of Spain, situated between 40° and 42° 55' N. lat., 2° 10' W. and 1° 45' E. lon., is bounded on the E. by Catalonia and part of Valencia; by Navarre and Old Castile on the W.; on the S. by Valencia; and on the N. by the Pyrenees. It extends about 130 miles from E. to W., and 200 from N. to S., and has an area of 15,000 square miles. It is now divided into the modern provinces of Saragossa, Huesca, and Teruel. Aragon may be compared to a large basin surrounded on all sides by mountains. The Pyrenees and their ramifications separate it from France, the Sierras of Molina and Cuenca from Castile, and those of Morella from Valencia. The principal of these mountains is the great Pyrenean chain. The offsets of this range, which penetrate into Aragon, form a number of lateral valleys with a rapid slope to the south. The loftiest peak of the range situated in Aragon is Pic Nethou, or Maladetta, 11,168 feet above the sea level. All the summits in this part are covered with snow nine months in the year, and even in June it is often found 5 or 6 feet deep.

Almost all the rivers of Aragon have their source either in the Pyrenees or in a secondary chain called the Iberian; they flow in different directions to their common receptacle the Ebro. This river crosses the province from N.W. to S.E., and divides it into two nearly equal parts. Near the Sierra Molina is an extensive lake, with an area of about 6000 acres, known as Gallocauta.

The climate of Aragon varies according to the elevation and particular situation of the different districts, but in general, except in the mountainous parts, it is adapted to most of the productions of the temperate zone.

The productions of the soil are wheat, barley, rye, oats, Indian corn, leguminous vegetables, esparto or Spanish broom, flax, hemp, sunach, barilla, madder, saffron, liquorice, fruits, oil, wine, and timber. The productions of the mineral kingdom are gold, silver, copper, iron, lead, quicksilver, cobalt, alum, jet, coals, salt, and copperas; few of these mines are, however, worked. Peat earth is found in the district of Teruel, and used for fuel. The mountains abound in timber; wolves and bears are found, and numerous herds of cattle and sheep feed in the valleys. The rivers produce excellent fish, particularly trout and eels. The industry of Aragon is very limited, and consists principally in manufactories of common cloth, hemp, sandals, sacks and cordage, hats, leather, paper, earthenware, and some iron foundries.

In the early history of Aragon we find the province successively under the dominion of the Carthaginians, Romans, and Goths. When the Arabs invaded Spain, those Aragonese who escaped the sword of the invaders sought a refuge in the fastnesses of the Pyrenees, where they assembled together in the valley of Sobrarbe in Navarre,

and chose for their leader Garcia Iniguez, called also Inigo Arista. Thus arose the kingdom of Aragon, more nearly resembling what would now be called a constitutional government than almost any other country in Europe. The kingdom was founded about A.D. 819. The king, the justitia or chief administrator of the laws, and the cortes, or parliament, had their respective rights and duties exactly defined. The cortes were composed of four orders—ecclesiastics, nobility, caballeros, and representatives of towns. Each order decided on a measure separately, by majority; but all were required to consent to a law before it could become binding. The country was governed by its own kings until its union with Castile, in 1469, on the marriage of Ferdinand and Isabella.

ARAGONA, a town of Sicily, 7 miles N.N.W. of Girgenti. It is badly built, but contains an old castle, with some good paintings and a collection of antiquities. In the neighbourhood almond and other fruit trees are much grown. Near the town are the famous mud volcanoes of Maccaluba, which discharge a fine cold mud, mingled with water, petroleum, and salt, sometimes attended with reports resembling those of artillery. Population, 12,000.

ARAGONITE is a mineral which has a right rhombic prism as its fundamental form, but presents many modifications. These crystals have been found abundantly in a ferruginous clay in Aragon in Spain, where they occur accompanied by sulphate of lime; they generally occur in beds of gypsum and in iron-ore, and occasionally in basaltic rocks; they are deposited also from the hot springs of Tivoli. In Great Britain, this mineral is found in Torbay, Cleator Moor, and the Leadhills. Aragonite is a carbonate of lime, chemically identical with calc. spar, but of different crystallized form, harder and harder than that substance. When carbonic acid gas is deposited from a cold solution, it crystallizes in hexagonal forms, as calc. spar; but the deposit from a warm solution is in the rhombic system as aragonite. The specific gravity is 2.93, and hardness 3.5–4. There is a beautiful branching snow-white variety, which is found associated with iron-ore, and is hence called flower of iron (*flor ferri*). Aragonite sometimes contains 1 or 2 per cent. of strontia.

ARAGUAYA, a river of Brazil, having its rise in the Sierra Sineba, in lat. 19° S. It flows in a northerly direction, and unites with the river Tocantins, having during its course, by a separation of its waters, formed the large island of Santa Anna, 200 miles long. The eastern of these two branches, the Para, is more generally navigated. The total length of the Araguaya is about 1000 miles.

ARAL, SEA OF ("Inland Sea"), the "Blue Sea" of the Russians, is a great lake to the south of the Russian government of Orenburg, situated E. of the Caspian Sea, between 44 and 47° N. lat., 58° and 62° E. lon. Its greatest length is about 200 miles from N. to S.; its breadth from E. to W. is irregular, but it is nowhere less than 130 miles, and in some places 250. Its depth is not great, and it abounds so much in sandbanks near its shores that the Kazakh fishermen, its only navigators, are obliged to use flat-bottomed boats for capturing the sturgeon and other fish which it contains. The southern extremity is studded with innumerable small islands at the mouth of the river Amou.

The water is brackish, like that of other lakes which are drained only by evaporation. A great diminution of its surface extent has taken place within a very recent period, and is still in progress. Two rivers of considerable magnitude discharge their waters into this lake, the Syr Daria or Sihoun, the ancient *Jaxartes*, flows into it from the E.; the Amou or Jirou, the *Oxus* of the ancients, enters it from the S. The lake, like the Caspian, has no outlet; and the whole of the water supplied by these rivers, as well as that of some minor streams, must

be carried off by evaporation. The supply is not, however, equal to the waste by evaporation, so that the level of the lake is gradually lowering.

It has been supposed that the Aral Lake and the Caspian were at one time united; the Greek geographers appear to have been of this opinion, or rather were ignorant of the existence of the Aral Lake. Sir H. Rawlinson and others think the Aral Sea was dry land during the Greco-Roman period, and again during the thirteenth and fourteenth centuries—the *Oxus* and *Jaxartes* then flowing into the Caspian. The independent investigations of Sir R. Murchison and of Herr Roesler caused them to conclude that at a remote geographical period the Aral and Caspian formed one common inland sea, and that the lofty Ust-Urt plateau gradually arose between the two seas. The subject is fully and ably treated in "Die Aralseefrage," by Robert Roesler (London, 1878). The districts surrounding the sea do not support a great variety of animals and plants.

ARALIA/CÆE are a small order of plants, nearly related to the *UMBELLIFERÆ*, from which they are known by their young fruit consisting of more parts than two. They are frequently shrubby, and not uncommonly furnished with powerful hard prickles; but they often are also herbaceous and unarmed, like umbelliferous plants themselves. The plants belonging to this order are found chiefly in the tropics, but a few are inhabitants of temperate regions in both hemispheres, and two species are peculiar to islands in the Antarctic Ocean. The genus *Aralia* is the type of the order, and the plants belonging to it are found in North America, Japan, the East, and New Zealand. *Aralia polaris* was found by Sir J. Hooker as far to the south as the Auckland Islands. *Aralia spinosa* is the angelica tree of America, where the berries are used in an infusion of wine or spirits for colic and rheumatics. It is a small tree, 8 to 12 feet high, with a prickly stem. Another North American plant, spikenard, is *Aralia racemosa*, only 3 or 4 feet in height, with smooth herbaceous stem and compound leaves. It yields an aromatic gum-resin. This is not the true spikenard of the ancients, which will be described under its proper heading. *Aralia nudicaulis* is diaphoretic, and is used sometimes as a substitute for sarsaparilla. *Gunnera scabra* was found by Darwin growing on the sandstone cliffs of Chile. It resembles rhubarb on a gigantic scale. The roots are used for tanning, and its fleshy leaf-stalks are eaten. Other plants of the order are IVY, the celebrated Chinese drug GINSENG, and the RICE-PAPER plant, a native of the island of Formosa.

ARAM. See ARAMÆA.

ARAM, EUGENE, a man of considerable erudition, was born at Ramsgill, a village in Netherdale, Yorkshire, in 1704. He was almost entirely self-educated, but managed by hard study to acquire a considerable knowledge of languages, together with heraldry and botany. He married early in life and settled as a schoolmaster at his native place. In 1731 he removed to Knaresborough, where he remained eleven years. At the end of this period he was concerned with a man named Houseman in a fraud upon the people of the neighbourhood, which was perpetrated by a shoemaker named Clarke, who obtained a considerable quantity of goods, plate, &c., and who immediately afterwards disappeared. Aram was charged with being an accomplice, and part of the goods were found buried in his garden, but he was discharged for want of evidence to commit him. After this he set out for London, and subsequently travelled to several places in England, acting as usher in different schools—finally settling at Lynn, in Norfolk. During his wanderings he accumulated materials for a work to be entitled "A Comparative Lexicon of the English, Latin, Greek, Hebrew, and Celtic Languages;"

but while engaged as usher he was suddenly arrested on a charge of murder. The circumstances which led to this were somewhat remarkable. In February, 1759, a skeleton was found at Thistlehill, near Knaresborough, and was supposed by the people to be that of Clarke, who had disappeared so mysteriously fourteen years before. Houseman, who still lived in the neighbourhood, being confronted with the bones, became greatly agitated and confused, and taking up one of them declared, "This is no more Clarke's bone than it is mine; Clarke never was buried here." Being arrested he confessed that Clarke had been murdered by Aram and a man named Terry, and that his body had been buried in a cave near Knaresborough. The place being searched a skeleton was found, and Aram being arrested Houseman was admitted as evidence against him. He made an elaborate defence, but was found guilty, and executed within three days after receiving sentence. In the interval he confessed his crime, and attempted suicide by opening a vein in his arm. His defence, which he had written out in full, is a very remarkable document, and a letter which he wrote to a clergyman during his imprisonment, discussing questions of language and ethnology, is still more surprising from the perfect self-possession it displays. The story of Eugene Aram forms the subject of one of Lord Lytton's earliest novels, and of a thrilling ballad by Thomas Hood, entitled "The Dream of Eugene Aram."

ARAMEÆA (Heb. *aram*, literally the high land, or plateau) is the name given by the ancient Jews to all the countries between Phœnicia, Palestine, Arabia, the Tigris, and Armenia, or to those countries which were called by the Greeks Syria and Mesopotamia. In the Old Testament it was divided into—1. Aram of Damascus, the territory of the Hebrews from the time of David to the Babylonian exile. 2. Aram Zobah, which Spanheim and Bochart think refers to that part of the territory of Hamath in which the town of Zobah was situated, not far from Tadmor or Palmyra. 3. Aram of the Two Rivers, or the countries between the Euphrates and the Tigris, which was also called Padan Aram, literally "the flat of the high land." This latter district is the Mesopotamia of the Greeks.

ARAMÆAN or **ARAMAIC LANGUAGE**, a branch of the Semitic, comprised two principal dialects—the Babylonian or East Aramaic, sometimes termed Chaldee, and Syriac or West Aramaic. Both dialects, though nearly extinct, are yet spoken by a few tribes dwelling in the ancient Aram. The sections in Daniel and Ezra called Chaldee, and a few words in Jeremiah and Genesis, are the most ancient remains of the East Aramaic dialect, which is called by the Jews the language of the Talmud or the language of learning, because parts of the Talmud and many rabbinical writings are composed in this language. This dialect after the Babylonian captivity gradually displaced the Hebrew, and was spoken generally by the inhabitants of Palestine at the time of Christ. The Aramaic version of the Scriptures was that in general use at that period, and the quotation from the beginning of Psalm xxii. made by Christ when on the cross is from the Aramaic version, and not from the Hebrew original. Many other occasional quotations and expressions used in the New Testament and in the writings of Josephus indicate the prevalence of the Aramaic language at that time. The Greek language, however, had been long firmly established in Palestine under the dynasty of the Seleucidæ, and it was also in common use at this period, though not the native tongue.

The West Aramaic or Syriac language is of greater historical importance than the East, as it possesses a large literature, consisting of works on theology, history, poetry, and even science and philosophy. The written characters differ greatly from Hebrew, but the oldest specimens

existing, which consist of some Palmyrian inscriptions, cannot be regarded as earlier than A.D. 47. A version of the Bible, containing all the books of the Old Testament and all those of the New, with the exception of 2 Peter, 2 and 3 John, Jude, and Revelation, was made into this language about the close of the first century. It is known as the Peshito, and is of great value to students of the history and text of the Scriptures. The language flourished until the tenth century, but afterwards, with the East Aramaic, gave way to the Persian and Arabic.

The standard work on the Aramaic language is that of Hoffman, entitled "Grammaticæ Syriacæ," libri iii., cum Tabulis variæ Scripturæ Aramaicæ generæ exhibentibus, (Hale, 1827), 4to. Syriac grammars have also been published by Uhlenann in German (Berlin, 1857), and in English by Cowper (London, 1858).

ARANDA, DON PEDRO PABLO ABARCA DE BOLEA, COUNT OF, descended from a very ancient and noble family in Aragon, was born about the year 1718, and embraced the profession of arms. In 1743 he was severely wounded in an engagement against the Austrians, near Bologna in Italy. Aranda was appointed ambassador to Frederick Augustus II. elector of Saxony and king of Poland. On his return to Spain he was sent to Portugal in command of the Spanish army then invading that country. In August, 1762, he reduced Almeida and other places; and peace was made soon after. In 1765 Aranda was appointed captain-general of Valencia, and in the following year he was called to Madrid, that capital being then in a state of violent commotion against the minister Squelcoe. The conduct of Aranda in this emergency fully corresponded with the confidence placed in his talents. With a courage, firmness, and perseverance which no obstacle could daunt, he undertook the reform of abuses in every branch of the administration, and the adoption of those improvements of which his country stood so much in need. Aranda also endeavoured to check the Papal power in Spain. The power of the Inquisition was greatly diminished by the establishment of a political censorship; but this attempt, and an imprudent disclosure of his further intention to abolish the Inquisition altogether, raised such a ferment against him, that, seeing his ruin unavoidable, he solicited to be appointed ambassador to France, and retired from the administration in 1773. Aranda returned from Paris in 1787, but remained more or less in disgrace until his death in 1799.

ARANJUEZ (*Ara Joris*), a town in Spain, in the province of Madrid, stands on the Tagus, 26 miles S.S.W. of Madrid, with which it is connected by railway. It was formerly the residence of the court from Easter to the end of June, on account of its advantageous situation (1650 feet above the sea) and the mildness of its climate. The palace is a handsome square building, with twenty-one windows in front, and a turret at each extremity. The gardens are particularly admired for their natural beauties, and for their magnificent elm trees, which were originally brought from England by Philip II. and have grown to an enormous size. The gardens are watered by the Tagus, which here forms a cascade with the whole width of its waters. The town is of modern construction. The streets are broad, very well paved, and intersect each other at right angles. The population amounts to about 1000. A treaty was concluded at Aranjuez between France and Spain in 1772, and Charles IV. abdicated the throne of Spain here in 1808.

ARAPAIMA is a genus of South American fresh-water fish of enormous size, being 15 feet in length and 450 lbs. in weight. The sturgeon, the largest fresh-water fish of the northern hemisphere, is not more than 10 feet in length. The Arapaima is of much the same width all down the body from the head, until it suddenly narrows just above the tail. On the head the skin is mostly replaced by bone,

and the body is covered with a mosaic of hard, bony scales. The mouth has a wide gape, with a prominent lower jaw. The teeth, on palate and jaws, are rasp-like, except an outer series on the jaws, which are small and conical. The pectoral fins are small, compared with the size of the fish; the short ventral fins are abdominal. The dorsal and anal fins extend along the lower third of the body. This fish is esteemed as food, both salt and fresh, and is an article of trade from the inland fisheries to the seaports. The family Osteoglossidæ, to which it belongs, is one of the *Physostomi*.

ARARAT, the name of a region in the centre of the highlands of Armenia. The mountains of this region are called the Mountains of Ararat, on which the ark rested (Gen. viii. 4). The whole of Armenia is called the kingdom of Ararat (Jer. li. 27). That Ararat was originally a name of the region appears from Moses of Chocne ("Compendium Geographiæ Universalis," pp. 46, 52).

ARARAT, MOUNT, a celebrated mountain of Armenia, situated to the S.W. of the town of Erivan—on the confines of Russia, Turkey, and Persia—about 5 miles from the right bank of the river Aras, the ancient *Araxes*. It rises majestically from the midst of a great plain, detached from the other mountains of the country, in two conical peaks, one of which is far above the limit of eternal snow. The Little Ararat, 13,000 feet in height, forms the cone of a volcano. Humboldt, on the authority of the Russian traveller Parrot, gave the height of the Great Ararat as 17,000 feet, and this was confirmed by Mr. Bryce in 1876. Treeless, waterless, solemn, and solitary, Ararat is one of the sublimest objects on the face of the earth. The smaller cone is separated from the greater by a plain of huge extent, and is considerably lower, for it now disappears from its summit in summer. Such a mountain must naturally be seen from a vast distance, and it serves as a landmark to the navigators of the Caspian Sea. A remarkable circumstance as connected with the traditions belonging to this mountain has been observed, namely, that when seen from afar and in certain positions, the summit has a striking resemblance to a ship. The whole country round is full of traditionary stories about Noah's ark and the flood. The higher regions are usually covered with clouds; and when these are dispersed, and the summit is unveiled, the devout Armenians fall on the ground, cross themselves, and pray. At Erivan they show the spot where Noah first planted the vine; and the name of another town, Nachichevan, or Nakhdjovan, means, according to Chardin, "place of descent," being the place where Noah first settled when he came out of the ark. It may be stated that another tradition—accepted alike by Christians and Mohammedans—fixed on Mount Judi, in the south of Armenia, as the ark's resting-place.

Several attempts have been made to reach the top of Ararat; but few persons have ascended beyond the snow belt. When in 1828 the Czar Nicholas defeated the Persians and annexed the territory round Erivan, his advisers insisted on bringing Ararat within the Russian territory, on account of the veneration wherewith it is regarded by all the surrounding races, and which is reflected on the sovereign who possesses it. No mountain save Sinai has such sacred associations, and Sinai itself has less of legendary lore attached to it. Persians, Tartars, Turks, and Kurds regard the mountain with reverence as genuine as that of the Christian races, for its majesty, its solitariness, and because they all believe in the deluge and the patriarch "faithful found." They are all equally persuaded that "Massis" (their name for the mountain) is inaccessible; they are not to be convinced by any testimony, not that of Parrot, of Aftonof, or of Abich—who respectively ascended Ararat in 1829, 1834, and 1845—of General Cluzak and his party, and the English-

men who ascended in 1856; and they also reject that of Mr. Bryce, who in September, 1876, ascended the mountain of the ark alone.

An excellent description of the mountain itself, and a most vivid account of Mr. Bryce's wonderful feat, is given in his "*Transcaucasia and Ararat*" (London, 1877).

AR'AS or **ER'AS** is a large river of Armenia, mentioned by Greek and Roman writers under the name of *Araxes*. It rises at Dekman, in Mount Bin-Gheul, about 20 miles S.E. of Erzeroum, and about 30° 47' N. lat., and 41° 9' E. lon. A branch of the North Euphrates rises on the opposite or western side of the same elevation, a fact known to Pliny (vi. 9). Its general course from this point is E. to within 8 or 10 miles of Erivan. From this point it takes a bend to the S.E. (passing the eastern base of Ararat) as far as the ruins of old Julfa, in the province of Nakhdjovan. Erivan and Nakhdjovan are in the Russian province of Armenia, which was ceded by Persia in 1828. From the ruins of Julfa the general course of the river is E. to the limits of Khaphan, where it turns N.E., running in this part of its course, with some considerable bends, through part of Nakhdjovan, Khaphan, and the Karabagh, to near Jevat, where it is joined by the Kur (*Cyrus*) coming from the Caucasus. The united stream, after running about 30 miles E., turns suddenly to the S., and enters the Caspian Sea by three mouths (about 39° 20' N. lat.). A long projecting piece of land is here formed between the Caspian on the E. and the small gulf of Kizilgatch on the W. After its junction with the Kur the river separates Great Armenia on the S. from Shirvan, and part of the ancient Albania on the N. The length of this important river is generally considered to be from 600 to 700 miles. Its course is very rapid, and it is ill adapted for navigation.

The Araxes receives numerous tributaries; the Zenghi, one branch of which flows from the large lake Sevan—said to be about 5000 feet above the sea—runs past Erivan, and joins the Araxes 21 miles from this town.

Many of the affluents of the Araxes rise in mountains covered with oaks, pines, and firs. The river abounds in a great variety of excellent fish. It is much disputed what river Herodotus (i. 202, iv. 40) means by the Araxes, as the name was given to various streams. An Araxes (now the Bund Emir) flowed through mountainous Persia, and entered the Lake of Bakhtegan. Xenophon, in his "*Anabasis*," gives the name of Araxes to the Aborris or Chaboras, now the Khabour, an affluent of the Euphrates.

ARATUS of Sicyon, a distinguished Greek statesman and general, the son of Clinias, tyrant of Sicyon, was born B.C. 271. In the political strife which prevailed at the time of his childhood his father was killed, and he himself was only saved by being withdrawn by his aunt, who concealed him for a time and then had him conveyed to Aysos. Arrived at manhood he returned to his native place and overcame the reigning tyrant Nicocles in a bloodless revolution. He restored the republican form of government, and procured the enrolment of Sicyon in the Achaean League. He successfully cultivated the friendship of Ptolemy Evergetes, king of Egypt, who by the present of a large sum of money rendered him material assistance in maintaining his power and influence. In the year B.C. 245 he was elected captain-general (stratêgos) of the Achaean League, and between this period and his death (B.C. 213) he held this office seventeen times. It was his aim to unite the whole of Greece (which indeed was only thwarted by the invincible mutual jealousy of the states) into a compact and independent nation; and the Achaean League, during the period in which its affairs were under his direction, became a powerful confederacy, including within its limits the whole northern coast of Peloponnesus, with Corinth, Megaris, and the greater part of Arcadia. Its growing

power, however, roused the jealousy of the Spartans. In the year B.C. 226 war broke out between the rival powers, and in the conflicts which ensued Aratus was repeatedly defeated, and the Achæans were compelled to invite the assistance of Antigonos Doson of Macedonia. By his aid the Spartans, under their king Cleomenes, were completely defeated at the battle of Sellasia, B.C. 222, which put an end to the war. In a subsequent war against the Ætolians, Aratus, at the head of the Achæan forces, was attacked (though without effect) for mismanagement of the campaign. Philip II., the young king of Macedonia, then came to the aid of the League, and at the head of the united armies he restored peace, B.C. 217. Philip's ambition led him into schemes for obtaining supremacy over the whole of Greece, and the honest conduct of Aratus soon became distasteful to him. To rid himself of the restraint thus imposed Philip procured the death of Aratus by poison, in the year B.C. 213.

Aratus was the author of a history of his own times (now lost), ending with the year B.C. 220, from the close of which Polybius commenced his own history.

ARAT'US, the author of two astronomical poems in Greek. He lived about the time of the first Punic War, and must be placed, as to the time of his notoriety, between Euclid and Apollonius of Perga. He was born in Cilicia, and studied medicine. It is stated that he was invited to Macedonia by Antigonos Gonatas, where he died.

By the desire of Antigonos, Aratus turned the "Phænomena" and the "Diosmeia" of Eudoxus into hexameter verse, and it appears from the commentary of Hipparchus, which is yet extant, that he made many alterations; for Hipparchus frequently cites the prose of Eudoxus and the poetry of Aratus together. Aratus is the second Greek writer on astronomy extant, Autolykus being the first. Aratus was probably neither an observer nor a mathematician, for in his description of celestial phenomena he uses no higher degree of precision than might have been attained by a mere spectator of the heavens.

Aratus in his poem lays down the doctrine of the immovability of the earth, and the motion of the heavens round a fixed axis. He describes the names and configurations of all the constellations then in use, their relative times of rising and setting, the march of the sun through the zodiac, and the milky way, which is described as one of the great circles of the heavens. The planets are simply mentioned as bodies having a motion of their own, but no idea is given of the length of periods. There is nothing on the orbit of the moon, or on the unequal motion of the sun in longitude. There are many mistakes as to the placing of the stars. The "Diosmeia" or "Prognostics" consists of materials for predictions of the weather. The poems were great favourites amongst the ancients.

The "Phænomena" was translated into Latin by Cicero, and several fragments of it still exist, as also of translations into Latin verse by Festus Avienus, and by Germanicus Cæsar, the father of the Emperor Caligula. (Editions by Bekker, with scholia, Berlin, 1828; by J. H. Vos, Heidelberg, 1824.) An English translation in verse was published by Dr. Lamb in 1848.

ARAUCAINIANS, the name given to a South American tribe inhabiting the country between the Chilian provinces of Concepcion and Valdivia. Formerly their territory was bounded on the north by the Bio-bio river; but this limit has in recent years been pushed further back, and is now marked by a line of forts along the river Malleco—a second fortified line along the Tolten river being the southern boundary. The country stretches east and west from the Cordilleras to the Pacific. Within these limits there are several tribes whose numbers have been variously estimated, but they probably amount altogether to about 40,000. They consist of four principal divisions, each headed

by its own prince. These, though independent of each other, form a band or confederation for mutual defence against a foreign enemy. Each of these four great divisions is divided into five smaller ones, and these are again subdivided into nine districts or septa. The numbers five and nine have a mystical character among the Araucanians. Leaders of all the subdivisions pass on their offices as hereditary to their sons in the order of primogeniture; and the whole body of the chiefs or caciques form the nobility. The caciques compose the great council of the nation, which meets annually under a great tree for the transaction of public business. As a matter of fact no decision come to at one of these diets is accepted by the people in general unless the latter admit its propriety: for the clansmen, being free and armed, rigorously impose limits on the exercise of authority. Polygamy is the rule, at least among the caciques, two and three wives being common in a chief's household. The Araucanians divide their years into seasons, months, and days. Their year is divided into twelve *cuyen*, or moons, of thirty days each, and five days are added to the last month. They divide the natural day into two equal parts, and these again they subdivide into parts, six for the day and six for the night; thus their *naguntu*, or hour, is equal to two of ours.

The only sciences which they cultivate are oratory, poetry, and medicine. Oratory is highly prized by them. The poetry consists of laudations of the prowess of their heroes. The language, which is sedulously kept pure from foreign idioms, is very copious. The only books existing in this language are catechisms, sermons, prayers, and other religious books, translated or composed by the Jesuits, to whose labours we are also indebted for most of the grammars and dictionaries of this tongue.

The Araucanian pantheon contains three or four divinities, a Supreme Creator, a god of good, and a god of evil, and perhaps a god of war. Religious rites and ceremonies there are few. Exorcisms by the *machis*, or wise women, and the sacrifice of some animal under the shade of the *drymis*, or white cinnamon tree, are among the few that the Araucanians are known to practise. They all believe in a future state, and at the death of a cacique sacrifice his horse to keep him company; while the coast tribe bury him in his canoe. Marriage by capture exists among them in a ceremony of a very remarkable kind. The bridegroom approaches the bride's house on horseback, and carries her off with him, in spite of the apparent opposition of her family, on his steel. The custom must have been in existence long before the Araucanians could have possessed or even have seen horses, which were unknown in their neighbourhood a little more than three centuries ago. It has, however, survived the introduction of these animals, and the remarkable changes in their way of life which must have been caused by it. They are not nomad, but intelligent and industrious agriculturists, who, however, occasionally shift their abodes in search of more fertile soil, or for other reasons. They live in well-built houses, the interiors of which are clean and neat. They are usually built near the banks of rivers, in which during summer the men bathe several times a day, and in winter at least once a day. The moral education of the children is not more constrained than their physical. Their parents instruct the males in the management of arms, and in speaking their language with freedom, elegance, and purity, allowing them to do everything without restraint; they very seldom inflict on them any corporal punishment, as in their opinion this practice tends to degrade them and make them cowards.

The Araucanians are of a moderate stature, strong, muscular, and well built, and naturally have a very martial air. Their colour, like the rest of the natives, is that of copper, although somewhat lighter; their face is oval, their eyes small, but lively and full of expression, the nose

rather flat, the mouth pleasing, with fine regular teeth; the legs well formed and muscular, with small and flat feet. They manufacture their own clothing, which is becoming and even picturesque. They seem to combine much of the civilization of the ancient Mexicans and Peruvians, with a freedom from barbarism and a love of liberty to which those races were strangers. They are bold, intrepid, courageous, and fearlessly expose their lives when the liberty of their country is at stake. They are also exceedingly jealous of their honour; hospitable, honest, grateful, generous, and humane to the enemies they have conquered; but are addicted to intoxication, and under its influence they sink to the level of the most irreclaimable savages.

From the time of their invasion in 1537, the Araucanians sustained an almost uninterrupted war against the Spaniards for nearly 300 years. It was not until 1773 that Spain was forced to acknowledge the Araucanians as an independent nation. In 1860 a curious episode commenced in the relations between Chili and the Araucanians. The chiefs of the latter had always defended themselves bravely against the Spaniards, and the Chilians had not subdued them; but for several years there had been amicable relations between them. Los Angeles had been made the capital, some forts had been built in the province, the couriers passed through safely, and travelling merchants brought the objects desired by the natives, and carried away the products of the country in exchange. In 1860, however, a French baronet, named Onile Antoine Tonnens, who had lived some years in Chili, wandered to the Araucanians, contrived to gain the confidence of the people and the respect of some of the chiefs, declared himself king and his title hereditary, issued a manifesto asserting his independence and his throne, and succeeded in raising large numbers of followers, to whom he promised the extension of their dominions. While travelling for this purpose, however, he was betrayed by a servant, who apprised the Chilians of his route. A party of soldiers surprised and captured him in February, 1862; the king was confined to prison, and the kingdom was extinguished without a blow. Mr. Tonnens was subsequently liberated and returned to Paris. Although the country was made a province of Chili after the capture of the "king" in 1862, the Araucanians still retain a large amount of independence. They are, however, being gradually reduced to somewhat more subjection, and some settlements of Chilians have been formed amongst them. An interesting account of a visit to the country of the Araucanians is given in Mr. Norton Boyd's "Chili. Sketches of Chili and the Chilians during the War of 1879-80" (London, 1881).

ARAUCARIA is a genus of coniferous trees of the tribe **ARAUCACEÆ**. It is known from the other genera by the cones having many scales, and by the scales having a single sharp tooth. There are seven species, each restricted to some particular locality in the southern hemisphere. They are remarkable for their vast size and the singularity of their branches, stiff and rigid in some, and "graceful as orchid branches" in others, e.g. in *Araucaria excelsa*.

Araucaria imbricata (the Chili pine or monkey puzzle) was first known till 1782, when the botanist Pavon first ascribed it to its native haunts in the mountains of the **ARAUCANIAN** Indians of Southern Chili. A little later Poeppig visited the country, and wrote an interesting account of it in his "Travels in South America." He says that between Antuco and Valdivia forests of this tree grow only along the western slopes of the Andes from the snow-line (at 2000 feet) below it, but that further south it is found on mountains of a very moderate elevation near the sea. "The *Corcovado*, a mountain that rises opposite Chiloé, is clothed from its foot to the snow-line with large green, beautiful trees. . . . Stop rocky ridges, where the water, are its favourite habitat." The

trunk is quite straight, reaching to a height of 150 feet. The branches are horizontal, in whorls of five or six, and decreasing in length towards the top so as to form a pyramid; they are thickly covered with scale-like, sharp-pointed leaves, more than an inch broad, hard and woody. The cones are as large as a man's head, growing at the ends of the branches. As the seeds are nutritious and palatable, the vast forests afford the Araucanians an inexhaustible supply of food. When the seeds are ripe, towards the end of March, the cones fall to pieces, and the seeds lie in such abundance on the ground that only a small part is consumed. The wood is heavy, but very solid and hard, taking a beautiful polish. The resin is used by the Chilians medicinally, as a diuretic, as a remedy for ulcers, for strengthening fractures, and for headaches. The Chili pine is useful for ornamental purposes, and grows as far north as Dunrobin in Scotland.

Araucaria Brasiliensis (the Brazil pine) is similar to the last, but is more spreading; the leaves are not so stiff, are longer, and overlap one another more loosely. The scales of the cone also differ in having a spiny point, turned downwards. This species is found in the forests of Minas, a province of Brazil, where it attains the height of 100 feet. The seeds are edible, and the resin is used in making candles.

Araucaria Rulii is more limited in its habitat than perhaps any other member of the vegetable kingdom; it is found at the top of an extinct volcano on one of the islets near New Caledonia. The volcanic ash amongst which it grows is as hard as a rock, but in winter rain falls in great quantities. It grows to the height of 50 feet, its branches are much more numerous than those of the Chili pine, and the scales of the cone have a sharp point which projects an inch from the surface.

Araucaria Bideilli is named after Mr. Bidwill, who has described it as it grows on the Brisbane Mountains, and near Moreton Bay, Australia. He says that, as he saw the trees growing thickly in the forests, the only living branches were quite at the summit, occupying perhaps only one-thirtieth part of the whole height, 100 to 150 feet, and that these branches are only 1½ inch thick, and about 12 feet long; from these to about half-way down there are several dead branches. There is no doubt, however, that the trees would have quite another look if grown in the open. The seed is twice as large as in the Chili pine, very sweet before it ripens, and in this condition is eaten raw by the natives, but when ripe is pounded and made into cakes. The wood is very close grained and durable. The leaves, instead of being pressed closely to the branchlets, stand out almost at right angles. The cones are about 9 inches long; the scales 4 inches long, standing straight out from the centre, with points "so stiff as to pierce thick gloves."

Araucaria Cunninghamii (the Moreton Bay pine) has for its habitat a long range of 900 miles along the eastern coast of New South Wales. It is described by Cunningham as attaining its greatest height, 130 feet, within the influence of the sea-air. But it decreases in size inland until it disappears altogether at 80 miles from the coast. The cones are 3 inches long; the scales have winged margins, with spiny points turned backwards.

Araucaria excelsa (the Norfolk Island pine) was discovered by Captain Cook on his second voyage. It is a magnificent tree, growing very straight to a height sometimes of 200 feet. The lower 50 feet are without branches, and measure as much as 27 feet in circumference. The cones in form resemble a globular pine-apple. The wood is very heavy, and is suitable in building for inside work. The knots are close-grained and suitable for turning. This species is found in Australia, New Caledonia, Norfolk Island, and the Isle of Pines.

Araucaria Cookii is found on New Caledonia and New Hebrides. In many respects it resembles the Norfolk Island pine.

ARAUCA'RIÆ, a tribe of the CONIFERÆ, includes, according to Benthani and Hooker's *Genera Plantarum*, the orders AGATHIS, ARAUCARIA, CUNNINGHAMIA, and SCIADOPITYS. This tribe is distinguished from other conifers by the scales of the female cone being very numerous, overlapping in several spiral series; the scale, which bears the inverted ovules or young seeds, is fixed closely to the bract; and the seeds are either not winged, or only at the sides. The Arancariæ are found in China and Japan, Australasia, the islands of the Pacific, and South America.

ARAU'RE, a city of Venezuela, situated on the river Aarigua, in the province of Apure. It stands in the heart of a large pastoral district, and its inhabitants pay much attention to the rearing of cattle. Cotton and coffee are extensively cultivated. The population of Araure is about 10,000.

ARAVULL'I is a mountain range of northern India, which extends in the direction of N.N.E. for about 300 miles through the Rajputana states and the British district of Ajmere-Mhairwara. Its breadth is various; from the southern extremity to the fortress of Koomulmar it extends about 60 miles from W. to E., and is composed of numerous high ridges, generally running S.W. and N.E. To the north of Koomulmar it forms one uninterrupted and compact range of table-land, from 6 to 20 miles in width. Thus it continues up to the town and valley of Ajmere, where it begins to break into lofty ridges, sending out branches which terminate to the south of Kancond and Rewaier. This mountain chain does not rise to more than about 3000 feet above the level of the sea; but the extreme steepness of its declivity to the west renders it impossible for the boldest invader to attack India on this side. To the north it is skirted by the Indian desert, a country which rather resembles the high plains of Persia than the Sahara of Africa. The southern extremity of the Aravulli range is united to the Vindhya Mountains by an extremely hilly and broken country, extending from Edur to Luma-wara, on the river Mylie, occupying all the country on the upper part of that river and its branches, and joining the Vindhya Mountains near Champanair. This range is composed of rocks of primitive formation, granite, quartz, compact dark-blue slate, gneiss, and syenite. The peaks present an almost dazzlingly white appearance, from the presence of enormous masses of quartz, which resembles perpetual snow. The highest peak is Mount Abu, which attains an elevation of 5700 feet. Garnets, rock crystal, and some inferior kinds of emerald are found.

ARAX'ES. See ARAX.

AR'BALEST or **AR'BLAST** (Latin, *arcubalista*—from *arcus*, a bow, and *ballo*, to cast or shoot), a cross-bow. This machine appears to have been derived from the larger *ballista* and was probably introduced into England by the Normans, who used it with great effect at the battle of Hastings. The arrows used for the cross-bow were called *quarrels*, from the French *carreaux*, a term which indicates the square form of their heads. See ARCHERY.

AR'BE, an island in the Gulf of Quararo, in the Adriatic Sea. Its surface, which is very mountainous, has an area of about 29 square miles; it contains four valleys, which have a very productive soil. It produces wine, olives, figs, corn, and timber; these, together with its fishery, salt-pans, and numerous flocks, afford lucrative occupation to its inhabitants, who are about 4000 in number. The chief town is Arbe, which has a good harbour, and is the see of a bishop. The island is included in the Austrian province of Dalmatin.

ARBE'LA (now Arbil or Erbil), a miserable village

which lies on the ordinary route from Bagdad to Mosul, in 36° 11' N. lat., according to Niebuhr's observations. It is situated between the Little and Great Zab (the Lycus), but nearer the latter, in a hilly and tolerably fertile district. Part of the town, which consists of wretched houses built of sun-dried bricks, is on a hill, and part around it. The population is about 4000, chiefly Kurds. Arbela has given name to the last great battle between Alexander and Darius, B.C. 331, in which the latter was completely defeated. The battle actually took place at Gaugmela, about 20 miles distant; and it was only in the subsequent pursuit that Alexander arrived at Arbela, where Darius had left his treasure and baggage.

AR'BITRAGE is the name given to those financial transactions which consist in dealing between markets, in order to take advantage of such differences of prices as arise from local or temporary causes.

In every stock exchange or bourse in Europe and America business is done in securities which, from their wide dispersion, possess an almost international character. These being in the shape of bonds or shares payable to bearer, and being largely held by bankers and financiers, are continually changing hands, and are subject to frequent fluctuations in price. Such stocks are those of the chief European and United States loans, with the exception of the British funds, the shares and obligations of the Lombardo-Venician railways, and in a lesser degree certain American railway bonds and shares, which are largely held in Europe as well as the United States. Official and newspaper telegrams, giving the prices of the principal securities, are freely exchanged between the various money markets; but it is the business of the arbitrageur to be a little beforehand with these, and by means of private telegrams or letters to take the first advantage of the difference in price. This involves the purchase or sale in one stock exchange, and the corresponding immediate sale or purchase in another, at such a difference in price as will cover the cost attending the two transactions and the transfer of the securities from the one place to the other, and leave a profit to the operator.

Other branches of this kind of business in billian, coin, and bills are very successfully worked by many of the leading financial houses of Europe, but the term is chiefly used to designate transactions in securities.

ARBITRA'TION is the adjudication upon a matter in controversy between individuals by a person appointed by the parties. The person appointed to adjudicate is called an arbitrator or referee. The matter on which he is appointed to adjudicate is said to be referred or submitted to arbitration. His judgment is called an award. The matters that can be referred to arbitration are such as may be the subject of an action at law or a suit in equity. An agreement to refer any differences which may hereafter arise is not in itself binding, for the parties cannot be compelled to name an arbitrator. But an agreement may be made to refer any dispute that may arise to arbitration, with a condition of certain penalties, to be paid by the party who shall refuse to agree in the appointment of an arbitrator. Any number of persons may be named as arbitrators; if the number is even, it is usually provided that, if they are divided in opinion, a third person shall be appointed, called an umpire, to whose sole decision the matter is then referred.

A dispute may be referred to arbitration, either—1, when there is an action or suit already pending, between the parties relating thereto; or 2, when there is no such action or suit.

1. In the former case the reference may be made at any stage of the proceedings. If before trial, it is effected by a judge's order, or a rule of the court of law, or an order of the court of equity in which the action or suit is brought; if at the trial, by an order of Nisi Prius, which may afterwards be made a rule of court. The usual mode of pro-

ceeding in a case referred to arbitration, where an action is pending, is for the parties to consent that a verdict shall be given for the plaintiff for the damages laid in the declaration, subject to the award of the arbitrator.

The person named as arbitrator is not bound to accept the office; but having accepted he is compelled to proceed with it, and a refusal to do so renders him liable to damages. If the arbitrator refuses to act that reference is at an end, unless the contingency has been provided for.

The order of reference usually provides that the award shall be made within a certain period, and if the arbitrator lets the day pass without making his award his authority ceases; but a clause is usually inserted to enable the arbitrator to enlarge the time. The authority of an arbitrator ceases as soon as he has declared his award.

The extent of an arbitrator's authority depends entirely on the terms of the reference. It may either be confined to the action pending between the parties, or it may include any other specified grounds of dispute, or all disputes and controversies whatever existing between them at the time of the reference. Where the matters referred to him are specified it is his duty to decide upon them all; where they are not specified it is his duty to decide upon as many as are laid before him.

An arbitrator's decision is conclusive. But if his award be partially or improperly made the superior courts have the power of setting it aside upon application being made within a certain time. This happens either (1) where the award is not co-extensive with the arbitrator's authority; or (2) where it appears on the face of it to proceed on mistaken views of law, or to fall in some of the qualities required for its validity; or (3) where any misconduct has been committed by the arbitrator.

When the award has been made and delivered, if one of the parties refuses to comply with it, the other may bring an action against him on the award. But the most efficient remedy is to apply to the court for an attachment, grounded on the contempt of court which he has been guilty of by disobeying the order of reference.

When, in the original action, a verdict has been taken, subject to a reference, the successful party may enter a judgment and sue out execution for the whole damages certified by the arbitrator. If other matters besides those in difference in the case be referred, the award as to such matters can only be enforced by action, attachment, or execution.

When no action has been commenced the parties may refer their differences to arbitration by mutual agreement.

The submission may be in writing or by parol, in which last-mentioned case, however, the submission cannot be made a rule of court; but by the Common Law Procedure Act, 1854, every agreement or submission to arbitration by consent, whether by deed or instrument in writing, not under seal, may be made a rule of any of the divisions of Her Majesty's High Court of Justice.

There are no means of compelling the attendance of witnesses, nor has the arbitrator the power of administering an oath until the submission is made a rule of court; but the witnesses and—if they have agreed to be examined—the parties are sworn, either before a judge, or in the country, before a commissioner. They may, however, be examined without having been sworn, if no objection is made to it at the time.

The courts cannot enforce performance of the award by attachment; the only remedy is an action on the award itself, or rather on the agreement of submission.

By the Common Law Procedure Act, 1854, a judge can order the proceedings to be stayed where an agreement to refer has been made. By this Act also, if it appears to the satisfaction of the court or a judge, at any time after the issue of the writ, that in the case of an action pending

the matter in dispute is one of account, it shall be lawful for such court or judge, on the application of either, to compel an arbitration.

By an Act of Parliament passed in 1850 railways were specially empowered to settle all disputes between themselves by arbitration; and public opinion and legislation have of late years been very much in favour of adopting this course of proceeding wherever practicable. It has recently been acted on with success in trade disputes between masters and men as to the rate of wages, hours of labour, &c. The "Employers and Workmen Act" of 1875 provides for recourse being had to arbitration whenever possible. See PRUDHOMMES.

Arbitration, in international law, is one of the recognized modes of terminating disputes between independent nations. It has been by some regarded as a universal substitute for war, but hitherto there has been no inclination on the part of independent states to submit any but secondary questions to the decision of neutral parties. The most important experiment in such arbitration was the Geneva Convention of 1872, with respect to the losses inflicted on American commerce by the *Alabama* during the Civil War. See ALABAMA.

The only mode of referring a matter to arbitration in the Roman law was by an agreement containing the names of the arbitrators, the matters intended to be referred, and an undertaking, under a penalty, to abide by the award. The rules applicable to arbitration among the Romans have been the foundation of the system in modern Europe.

ARBITRATION IN SCOTLAND. The system of arbitration is a modification of that of the Roman law. The submission, by which the parties agree to abide by the decision of an arbiter, is a regularly executed contract, and it requires all the solemnities peculiar to the execution of deeds in Scotland. According to the practice by which, on the consent of the parties to that effect embodied in its substance, a contract may be registered for execution, the submission may contain a clause authorizing the decree to be pronounced on it to be registered for execution; and when so registered the arbiter's decision is in the same position as the decree of a court. It was formerly usual to embody a clause of registration for execution against the arbiter if he failed to give a decision. This practice is now disused, but it is still held, according to the doctrine of the civilians, that an arbiter who has accepted the submission can be judicially compelled to decide. Where there were two arbiters, and action was raised against one of them, either to concur with the other or name an oversman (umpire), "the court, without entering on the question how far a sole arbiter is bound to decide, were clear that against one of two arbiters the conclusions of the action were ill founded." (*White v. Fergus*, 7th July, 1796, M. 633.) The decree arbitral must be executed with the usual solemnities of written deeds in Scotland. A submission in which the arbiters are not named is not binding on the parties. If there be more than one arbiter the decree is not valid unless they be unanimous. An oversman may be named in the submission, or the arbiters may be empowered to choose one. It is a condition precedent to any reference to an oversman that the arbiters are not unanimous, and the proceedings of an oversman are null if there is no difference of opinion. The oversman's decree must bear that the arbiters differed in opinion. A time during which the submission is to be in force may be fixed with or without a power of prorogation. It has become a practice that, when a blank space is left in the submission for the period of its continuance, that period is held to be a year. Where there is no such blank it is presumed that the submission subsists for the period of what is called "the long prescription," viz. forty years.

ARBLAST. See ARBALIST.

AR'BOIS, a town of France in the department of Jura, is prettily situated on the Cuisance, in a deep valley 940 feet above the sea. It has a college and 6000 inhabitants, who manufacture earthenware, paper, oil, and leather, and trade in the excellent white wines of the district, which were celebrated as early as the fifteenth century. There are iron-works, hydraulic saw-mills, nitre-works, and nurseries in the town.

AR'BOR VITÆ is the common name given to the genus *Thuja* or *Thuya*, which belongs to the group *CYPRESSINÆ*, of the natural order *CONIFERÆ*. There are twelve species of *Thuja*, some of them natives of North America and others of Eastern Asia north of the tropics. The name *arbor vitæ* (tree of life) was given by Clusius, but for what reason is uncertain. In China the name "luk" (everlasting life), and in Japan "hiba" (tree of life), is given to native species. The name *Thuja* is from the Greek *thûa*, an African tree with sweet-smelling wood. The name *lûva* also occurs, and both these names are connected with *lûva*, to burn as an offering to the gods. It is not known what tree is referred to, but probably it was either an *arbor vitæ* or a juniper. The wood of the tree was both burned as a perfume and made into costly furniture. It was very durable and finely variegated.

The trees of this genus are evergreen, with small leaves fitting closely one over the other and arranged in four rows round the branchlets, which are generally flattened. The stamens and pistils are in separate flowers, but on the same tree, in solitary catkins at the ends of branches. The cone is not more than half an inch long, egg-shaped. The scales are arranged in opposite pairs, opening when the seeds are ripe, and not falling with them. The innermost and outermost pairs of scales are without seeds; between these are from one to three pairs with two or three seeds at the base of each scale. *Thuja occidentalis* (the western or American *arbor vitæ*) is a large shrub or small tree, 40 or 50 feet high, a native of North America, from Canada to the mountains of Virginia and the Carolinas. It is not so frequent in the southern states, but is found there on the steep banks of mountain torrents. In the northern states of America it is sometimes called the white cedar, but more commonly *arbor vitæ*. It grows best in cool moist places, on the borders of rivers and lakes, and in swamps, some of which it covers to the extent of 50 to 100 acres. The stem of this tree seldom rises straight from the ground, but makes a short bend before it becomes straight. On this account it is difficult to obtain trunks of any length, and although the timber is very durable it is not much used in building. For fence-work, however, it is largely used, as it lasts very much longer than other wood. In Great Britain the American *arbor vitæ* is planted as an ornamental shrub, for which purpose it flourishes best in low, humid, and sheltered situations; but the foliage turns brownish during the winter, and the shrub should therefore be avoided for this purpose. It is useful in nursery gardens for shelter, especially as it is of rapid growth. The cones are small, scarcely a quarter of an inch in length; the seeds are flattened, winged all round, with a notch at the apex. *Thuja orientalis* (the Oriental or Chinese *arbor vitæ*) is a native of rocky situations in Siberia and China, and on the mountains of Japan. It is a low tree, and easily distinguishable from the American species by its denser foliage and lighter green colour. It is a hardy plant, and flourishes in the gardens near London, where it was first introduced by Miller in 1752. The cones are half an inch long, composed of six scales, each with two wingless seeds.

ARBORICULTURE (Latin, *arbor*, a tree) takes cognizance of all that has to do with the planting and management of timber trees. The care of fruit trees

belongs to horticulture. Arboriculture is a branch of agriculture, but formerly it was not necessary to pay much attention to the subject, owing to the natural abundance of forests. In the fifteenth century the want of timber began to be felt in England, and has ever since been steadily increasing. A great impulse, and a proper direction, was given to arboriculture by the publication in 1664 of Evelyn's "Silva"; and the introduction of suitable foreign trees was rendered more easy by the establishment in the same century of botanic gardens in various parts of Europe. State departments have recently been created in India and on the Continent for the care and due maintenance of the existing forests.

Trees are planted for various purposes, for ornamenting cities and gardens, increasing the beauty of a landscape, giving shelter to cattle and corn lands, and above all for timber. When making choice of trees for ornament care should be taken that they are appropriate to the character of their surroundings. Pines, for instance, should not be planted along the approach to a house, as they suggest rather the bleak hillside than the comfort and repose of a dwelling-house; the weeping willow suits an artificial lake, where the weeping birch, being a wild tree, would be out of place. For general ornament the poplar and elm are very useful, also the laburnum, tulip tree, plane (especially in towns), oaks, cedars, firs, cypresses, ginkgo, *arbor vitæ*, holly, box, yew; in warm situations the evergreen oak may be used; near the sea the sycamore, tamarisk, maple, pinaster, elder; for a sterile sandy soil the Scotch pine and birch.

Trees are of great value in giving shelter to corn-lands and live stock, but if the plantations are too numerous they prevent that free circulation of air which is so necessary. What can be done in the way of clothing an unproductive surface of shifting sand may be seen in the complete change which has taken place on the sea-shore of Gascony since 1789, when M. Bremondier began sowing seeds of pinaster. In Great Britain seaside planting was initiated by the Earl of Leicester and Sir Fowell Buxton. Heath lands in Scotland are now extensively planted with pines, and it has been found that the timber is more durable than if grown on richer soil.

Trees grown for timber are conveniently divided into conifers and broad-leaved trees, and these latter again into hard-wood and soft-wood trees. The most useful conifers are the larch, Scotch pine, spruce fir, and silver fir; for these, according to Dr. Hugh Cleghorn, "are the trees which, in most parts of Britain, produce the greatest quantity of timber in their trunks relatively to that contained in their branches, and in the shortest time." Hard-wood trees are the slowest growers, but, on the other hand, their wood is the hardest and most durable. Among these are the oak, ash, elm, beech, hornbeam, sweet chestnut, sycamore, birch, walnut, and robinia. The soft-wood trees are of faster growth than these last, but are not so durable. The most profitable are the poplar, willow, alder, lime tree, and horse chestnut. The conifers yield resinous products, which in some parts of the Continent are a source of profit.

In planting trees attention should be paid both to the soil and climate. The articles on the various trees will show the importance of this; for instance, the oak prefers the clay soil of a valley; the Scotch pine a northern aspect with a sandy loam and shattery bottom; the deciduous cypress (*Taxodium distichum*) a warm climate and marshy soil. As a general rule conifers are most suitable for elevated ground and poor soil; soft-wood trees for low-lying moist lands; hard-wood trees only grow well in rich soil at a moderate elevation.

Plantations should be formed in almost all cases, not by direct sowing, but by transplanting young trees from the

nursery. Conifers require to be moved early, certainly not later than in their third year; hard-wood trees, which have been transplanted in the nursery every two years, may be left till their eighth or ninth year, but then need a rich deep soil and careful attention. Judicious pruning has a most important effect on the value of the timber. When branches are to be removed it is better, as a rule, to prune them close to the stem when they are no thicker than the thumb. From 4 to 6 feet is considered to be a good distance for planting. Thinning should soon begin, and be maintained continuously, for if performed only at long intervals the roots do not acquire such a good hold on the land as when they are allowed to accommodate themselves at an even and gradual pace. The trees which are planted with a view to their subsequent removal by thinning are called *nurses*; for this purpose larch and spruce are preferred. The nurses prevent the growth of side branches, and so increase the height of the permanent trees; they are also useful in sheltering from high winds and keeping down the growth of herbaceous plants.

(London's "Arboretum et Fruticetum Britannicum;" Giger's "Arboriculture," 1868; and James Brown's "Forester," 1871.)

ARBROATH or ARBROTHNOK, also ARBROTHNOK, a seaport and town in Forfarshire, Scotland, at the mouth of the small river Brothock. It is on the Caledonian Railway, 15 miles N.W. from Forfar, 16 miles N.E. from Dundee, and 60 N.W. of Edinburgh. The town is on the east side of the river in the parish of Arbroath; but the suburbs extend on the west side into the adjoining parish of St. Vige's, the church of which contains a very interesting Scottish sculptured stone, on which is inscribed what is believed by some to be the only legible Pictish inscription. There are some picturesque cliffs near the fishing village of Arbroath. The erection of Arbroath into a royal burgh dates from 1186, when it received a royal charter. It is governed by a corporation of eighteen councillors, one of whom is provost. Previous to the year 1842 it sent one member to Parliament, in conjunction with Aberdeen, Montrose, Bervie, and Brechin. It is now included in the Montrose district, which consists of Montrose, Arbroath, Forfar, Bervie, and Brechin. The population of the parliamentary borough of Arbroath in 1881 was 21,758—an increase of nearly 2000 compared with 1871, when the number was 19,974. There was formerly an abbey at Arbroath, founded by King William in 1178, and dedicated to Thomas a Becket. King John granted the monks and burgesses the extraordinary privilege of allowing them to trade with all places in England, except London, free from taxes. Bruce and the Scottish nobles met in the abbey in 1320 to resist the claims of Edward II. The building was destroyed in 1560, but considerable portions of the ruins yet remain. The last abbey was the most richly endowed in Scotland next to Holyrood. Of the monastic buildings, the parish church, an Episcopalian chapel, both with very elegant Gothic spires, a United Presbyterian chapel, and the British Linen Company's Bank are the most conspicuous. After the Reformation contains sixteen pieces of worship. The town has a handsome building. There are a good number of some excellent schools, and a handsome marketplace. The town contains a signal tower, 50 feet in height, for the purpose of communicating with the Bell Rock light-house, 12 miles distant. Most of the houses are built of red sandstone from quarries in the neighbourhood. Part of the High Street looks well, but most of the other streets are narrow. The town is well drained and healthy. The principal manufactures are yarn, spun from wool and hemp, and sail-cloth. There are many spinning-mills in the town and neighbourhood, chiefly

driven by the river; several factories for the manufacture of sail-cloth, and some large foundries and tanneries. The harbour has been much improved in recent years, and a wet dock was constructed in 1876.

The chief imports are flax, hemp, bones, bark, hides, and timber. The exports are principally barley, potatoes, fish, sail-cloth, stone, &c. The number of vessels registered as belonging to the port in 1885 was 31 (6000 tons). The entries and clearances each average about 300 (40,000 tons) per annum. The town is supposed to be the "Fairport" of Sir Walter Scott's "Antiquary."

ARBUTHNOT, JOHN, the son of a clergyman of the Scottish Episcopal Church, was educated in the University of Aberdeen, where he took his doctor's degree in medicine, and subsequently came to London in pursuit of fortune. He began by teaching mathematics as a means of subsistence, but soon attracted notice as a scientific writer. His extensive learning and conversational talents introduced him gradually into practice, and he became eminent in his profession. Arbuthnot was appointed physician in ordinary to Queen Anne in 1709, and admitted a fellow of the College of Physicians. He had for some years before been a fellow of the Royal Society. His talents, learning, and fascinating manners introduced him to an intimate correspondence and friendship with Pope, Swift, Gay, Parnell, and other leading wits of the period, who were all associated as members of the Scriblerus Club. In 1714 he engaged with Swift and Pope in a design to write a satire on the abuse of human learning in every branch. But the project was stopped, when nothing more than an imperfect essay towards it had been drawn out, under the title of the first book of the "Memoirs of Martinus Scriblerus." It is characterized by a brilliancy and exuberance, not to say extravagance, of wit and humour, which is pretty sure to tempt any who have once read it to a second perusal. "Gulliver's Travels" are said by Warburton to have been first intended as a part of these memoirs. The treatise, "Of the Art of Sinking in Poetry," the "Virgilius Restauratus," and the report "Straddling e. Stiles," are detached portions of the same work. The humorous political pamphlet of "John Bull," which has served as the model for many *jeux-d'esprit* upon the same plan, is generally believed to have been written by Arbuthnot. The queen's death, and the consequent disasters which befell his friends, deeply affected Arbuthnot's spirits. He lost his place and official residence at St. James's; but he continued the practice of medicine with success, and amused his intervals of leisure in writing papers of wit and humour. In 1734 he retired to Hampstead, in hope of some relief from his complaint of asthma. He died at his house in Cork Street, Burlington Gardens, in February, 1735.

ARBUTUS, a genus of evergreen shrubs belonging to the order ERICACEÆ. There are ten species, natives of Europe, North America (from Oregon to Mexico), and South America. The genus is characterized by the anthers having awns at the back, by the numerous ovules in each of the five cells of the ovary, and by its fruit being a berry. The most remarkable specimen is the *Arbutus of Virgil*, now called *Arbutus Unedo*, or the strawberry tree, from the resemblance borne by its berries to that well-known fruit. It is a native of the south of Europe and the Levant. In our gardens it proves a hardy evergreen tree, sometimes as much as 18 or 20 feet high, bearing its greenish-yellow blossoms in October and November, and its bright yellow and red berries, which are studded with little projections, in November and the succeeding months. The Oriental *Arbutus* (*Arbutus andrachne*) is superior to the last in beauty both of leaves and flowers, but it is much more tender, and does not bear fruit in Great Britain. It

is a native of the Levant. *Arbutus hybrida*, or the male arbutus, is apparently a hybrid between the two last, agreeing with *Arbutus Unedo* in the general aspect of its foliage—which is, however, larger and more handsome—and with *Arbutus andrachne* in flowers and in the deciduous bark. It is hardy and very ornamental, but it does not bear berries. The other species are chiefly American, and of less general interest.

ARC (from the Latin *arcus*, a bow) signifies any part of a curve line. The straight line which joins the extremities of the arc is called its chord.

The practical method of finding the length of an arc is as follows:—Divide the arc into a number of smaller arcs, making the number large in proportion to the degree of accuracy required, and add together the chords of the smaller arcs. The sum of the chords will differ very little from the arc, even when the number of subdivisions is not very large. For instance, the arc of the quadrant of a circle, whose diameter is ten million of inches, is 7,853,982 inches, within half an inch. Divide this quadrant into ten equal parts, and the sum of the chords is 7,845,910 inches; divide the quadrant into fifty parts, and the sum is 7,853,659 inches, which is not wrong by more than one part out of 24,316. Therefore, for every practical purpose, an arc of a circle (and the same may be said of every other curve) is the polygon made by the chords of a moderate number of subdivisions of the arc.

ARC, JOAN OF, or JEANNE D'ARC, surnamed the "Maid of Orleans," from her heroic defence of that city, was born about the year 1410 or 1411, in the little hamlet of Domremy, near the Meuse, and about 3 leagues south of Vaucouleurs, on the borders of Champagne. Her parents were humble and honest peasants. It appears from the copious depositions of witnesses from the neighbourhood of Domremy, examined at Joan's trial, that she was unremitting in her prayers and other religious exercises, and was strongly imbued, at a very early age, with the prevailing superstitions of her native place.

During that period of anarchy in France, when the supreme power which had fallen from the hands of a monarch deprived of his reason was disputed for by the rival houses of Orleans and Burgundy, the contending parties carried on war more by murder and massacre than by regular battles. At first the popular feeling was undecided; but when, on the death of Charles VI., the crown fell to a young prince who adopted the Armagnac side, whilst the house of Burgundy had sworn allegiance to a foreigner (Henry V.) as a king of France, then, indeed, the wishes and interests of all the French were in favour of the Armagnacs, or the truly patriotic party. Remote as was the village of Domremy, it was still interested in the issue of the struggle. It was decidedly Armagnac, and was strengthened in this sentiment by the rivalry of a neighbouring village which adopted the Burgundian interest.

Political and party interests were thus forced upon the enthusiastic mind of Joan, and mingled with the pious legends which she had caught from the traditions of the Virgin. A prophecy was current, that a virgin should rid France of its enemies; and this prophecy seems to have been realized by its effect upon the mind of Joan. The girl, by her own account, was about thirteen when a supernatural vision first appeared to her. She describes it as a great light, accompanied by a voice telling her to be devout and good, and promising her the protection of Heaven. Joan responded by a vow of eternal chastity. From that time the voice or voices continued to haunt her, and to echo the enthusiastic and restless wishes of her own heart. Her own simple and early account was that "voices" were her visitors and advisers; and that they prompted her to quit her native place, take up arms, drive the foe before her, and procure for the young king his

coronation at Rheims. These voices, however, had not influence enough to induce her to set out upon the hazardous mission, until a band of Burgundians, traversing and plundering the country, had compelled Joan, together with her parents, to take refuge in a neighbouring town; when they returned to their village, after the departure of the marauders, they found the church of Domremy in ashes. Such incidents were well calculated to arouse the indignation and excite the enthusiasm of Joan. Her voices returned, and incessantly directed her to set out for France; but to commence by making application to De Baudricourt, commander at Vaucouleurs. Her parents, who were acquainted with Joan's martial propensities, attempted to force her into a marriage; but she contrived to avoid this by paying a visit to an uncle, in whose company she made her appearance before the governor of Vaucouleurs, in May, 1428. De Baudricourt at first refused to see her, and, upon granting an interview, treated her pretensions with contempt. She then returned to her uncle's abode, where she continued to announce her project, and to insist that the prophecy, that "France, lost by a woman (Isabel of Bavaria), should be saved by a virgin from the frontiers of Lorraine," alluded to her. She it was, she asserted, who could save France, and not "either kings, or dukes, nor yet the King of Scotland's daughter"—an expression which proves how well-informed she was as to the political events and rumours of the day.

The fortunes of the Dauphin Charles at this time had sunk to the lowest ebb; Orleans, almost his last bulwark, was besieged and closely pressed; and the loss of the "battle of Herrings" seemed to take away all hope of saving the city from the English. In this crisis, when all human support seemed unavailing, Baudricourt no longer despised the supernatural aid promised by the damsel of Domremy, and gave permission to John of Metz and Bertram of Poullengy, two gentlemen who had become converts to the truth of her divine mission, to conduct Joan of Arc to the dauphin. They purchased a horse for her, and at her own desire furnished her with male habits, and other necessary equipments. Thus provided, and accompanied by a respectable escort, Joan set out from Vaucouleurs on the 13th of February, 1429. Her progress, through regions attached to the Burgundian interest, was perilous; but she at length arrived safely at Chinon on the eleventh day after her departure from Vaucouleurs.

Charles, though he desired, still feared to accept the proffered aid, because he knew that the instant cry of his enemies would be, that he had put his faith in sorcery, and had leagued himself with the infernal powers. But, after much ceremonial and credulous examination of her claims, her wishes were acceded to, and she received the rank of a military commander. The details of the military proceedings, and her success in raising the siege of Orleans and performing her promise of having Charles crowned at Rheims, belong rather to the histories of France and England than to her biography here. After the coronation it is stated she wished to retire to her native village; but the French court, unwilling to relinquish the support derived from her name, prevailed on her to continue her career. In an attack on Paris she was repulsed and wounded, and while defending Compiègne she was taken prisoner in a sally, conveyed to Rouen, and there, at the earnest demand of the University of Paris, tried on a charge of sorcery, while letters exist proving the extreme reluctance of the English council to proceed to extremities against her. At length, however, the university prevailed, the trial proceeded, and, after several months' interrogatories, the judges who conducted the trial drew from her confessions the articles of accusation. These asserted that Joan pretended to have had visions from the time when she was thirteen years old; to have been visited by the

archangels Gabriel and Michael, the saints Catherine and Margaret, and to have been accompanied by these celestial beings to the presence of the Dauphin Charles; that she pretended to know St. Michael from St. Gabriel, and St. Catherine from St. Margaret; that she pretended to reveal the future; and had assumed male attire by the order of God. Upon these charges her accusers wished to convict her of sorcery. Moreover, they drew from her answers that she declined to submit to the ordinances of the church, whenever her voices told her the contrary. This was declared to be heresy and schism, and to merit the punishment of fire.

These articles were despatched to the University of Paris, and all the faculties agreed in condemning such acts and opinions as impious, diabolical, and heretical. This judgment came back to Rouen; but it appears that many of the assessors were unwilling that Joan should be condemned: and even the English in authority seemed to think imprisonment a sufficient punishment. At length she was brought forth on a public scaffold at Rouen, and the Bishop of Beauvais preceeded to read the sentence of condemnation, which was to be followed by burning at the stake. Whilst it was reading, every exhortation was used, and Joan's courage for once failing, she gave utterance to words of contrition, and expressed her willingness to submit, and save herself from the flames. A written form of confession was instantly produced and read to her, and Joan, not knowing how to write, signed it with a cross. Her sentence was commuted to perpetual imprisonment, "to the bread of grief and the water of anguish." She was borne back from the scaffold to prison; whilst those who had come to see the sight displayed the usual disappointment of unfeeling crowds, and even threw stones in their anger.

When brought back to her prison, Joan submitted to all that had been required of her, and assumed her female dress; but when two days had elapsed she heard her voices reproaching her, and under this impulse she seized the male attire which had been perfidiously left within her reach, put it on, and avowed her altered mind; her resumed belief, her late visions, and her resolve no longer to belie the powerful impulses under which she had acted.

The Bishop of Beauvais knew that, if Joan were once out of the power of the court that tried her, the chapter of Rouen, who were somewhat favourably disposed, would not again give her up to punishment; and fears were entertained that she might ultimately be released, and gain new converts. It was resolved, therefore, to make away with her at once, and the crime of relapse was considered sufficient. A pile of wood was prepared in the old market at Rouen, and scaffolds placed round it for the judges and ecclesiastics. Joan was brought on the last day of May, 1431; she wept piteously, and showed the same weakness as when she first beheld the stake. But now no mercy was shown. They placed on her head the cap used to mark the victims of the Inquisition, and the fire soon consumed the unfortunate Joan of Arc. When the pile had burned out, all the ashes were gathered and thrown into the Seine.

It is difficult to say to what party most disgrace attaches on account of this barbarous murder: whether to the Burgundians, who sold the Maid of Orleans; the English, who permitted her execution; the French, of that party who brought it about and perpetrated it; or the French of the opposite side, who made so few efforts to rescue her to whom they owed their liberation and their national existence. The story of the Maid of Orleans is throughout disgraceful to every one, friend and foe; it forms one of the greatest blot and one of the most curious enigmas in history. It is a curious fact that an impostor, who pretended to be Joan of Arc escaped from her confinement, was acknowledged so early as 1436 by many, including even Joan's own mother, as the heroine of Orleans. From

this and a few other circumstances some writers have endeavoured to show that Joan was not burnt after all, but in our opinion their arguments are very weak; and if she was not really executed, all faith in history must cease, as there is scarcely any fact better attested.

The works on the subject of Joan of Arc are very numerous. M. Chaussard enumerates upwards of four hundred, either expressly devoted to her life or including her history. Her adventures form the subject of the bitter mocking poem *La Pucelle*, by Voltaire—a disgrace to his name; a noble tragedy by Schiller; and of a poem by Southey—one of his best works.

ARCA or **ARK-SHELL** is the name of a genus of bivalve shells (*LAMELLIBRANCHIATA*), the type of the family *Arcadeæ*. The valves of the shell are equal. The beaks (umbones) are, as usual in the *Lamellibranchia*, turned towards the mouth. They are separated by a flat lozenge-shaped space occupied by the ligament. This ligament is situated in most *Lamellibranchia* behind the beaks. It is kept on the stretch when the valves are closed, so that when the animal wants to open its shell it simply relaxes the interior muscles. The hinge-line is straight, extending nearly the whole length of the shell, with a long row of similar comb-like teeth. The "pallial line," or impression made on the shell where the mantle (external covering of the animal) becomes detached, is without any notch, showing that there are no siphonal tubes for the passage of water, in and out, to the gills; and the margins of the mantle are therefore not united to form a closed gill-chamber. The posterior impression of the muscle for closing the shell is double. The foot of the *Arca* is long, pointed, and deeply grooved. The *Arca* live in holes in rocks, or in the empty burrows of boring-shells. They are almost all marine, and are found in all parts of the world. Fossil species are numerous from the Lower Silurian up to the Tertiaries. Pearls of a purple colour are sometimes found in the shells. A very widely distributed species is the *Arca Noë* (Noah's Ark), 2 inches long, of a deep amber colour, or whitish with brown bands.

ARCADE properly signifies a series of arches on insulated piers, forming a screen, and also the space inclosed by such. It is sometimes applied to the row of piers or columns and arches by which the aisles are divided from the nave of a church, or by which the cloisters are inclosed; but it is more generally confined to those series of smaller arches which are used simply for purposes of ornament. A row of merely decorative arches along a wall is called an arcade in architecture.

In addition to its proper technical meaning, this term has acquired a different signification among us as the popular name for what the Parisians more properly designate a "passage" or "galerie," viz., an alley lined on each side with shops, and roofed over so as to be in fact a sort of in-door street, entirely protected from the weather, and of uniform design throughout in its architecture.

ARCADELT, JACOB, one of the greatest of the musicians of the Netherland school, the cradle of modern music. Like many musicians of his country and his age, he eventually went into the service of the popes at Rome; and he was singing master to the boys of the Papal Chapel in 1539. Later in life we find him in France in the service of the Duke of Guise. Many madrigals and some church music of Arcadelt's have been preserved, and are very fine work of the period, especially the former. An "Ave Maria" of great beauty of this composer is still a favourite, having enjoyed therefore a life of about 350 years. From Arcadelt and his Belgian comrades at Rome came the great school of *PALESTRINA*.

ARCA'DIA, one of the ancient provinces of the Peloponnesus, now the Morea, comprising the central part of the peninsula. Its greatest length from Kalavryta (the

ancient *Cynatha*) in the north to Samara in the south, near which it must have been separated from Laconia, was about 50 miles. Its breadth varied from 35 to 41 miles.

The ancient Arcadia somewhat resembled Switzerland in being hemmed in by great mountain ranges. The people were thus isolated, and remained undisturbed amidst the many convulsions of Greece. So antiquated were they in their customs that the Greeks regarded them as *autochthones*, that is, the original dwellers on the soil. They were hunters and tenders of cattle, and sometimes served for pay in armies of other nations, resembling in these particulars the Swiss; simple and fond of music; especially worshipping the nature-god PAN and the huntress ARTEMIS. They were long governed by kings, but after they had killed their king Aristocrates (who basely deserted ARISTOMENES and the Messenians), they split up into republics—Mantinea, Tegea, Orchomenus, &c. Many times attacked by the Spartans, the mountaineers yet succeeded in preserving their independence till the fall of Sparta at Leuctra (B.C. 371). About this time they instituted a general assembly of all the states, and built Megalopolis for the capital; and they joined the ACHÆAN LEAGUE in the middle of the third century B.C. A century later it was annexed to the province of Achaia in the general conquest of the country by Mummius, and thus absorbed into the great republic of Rome.

Arcadia was with ancient poets (and therefore with their modern imitators) the ideal home of shepherd life, and "Arcadian simplicity" has passed into a proverb.

ARCADIUS, Emperor of Constantinople, son of Theodosius the Great, whom he succeeded A.D. 395. He was a mere puppet in the hands of ambitious men, who pursued their own interests without regard to the happiness of the people. Theodosius by his will divided his empire between his two young sons, Arcadius and Honorius. Arcadius became emperor of the east, and reigned over Thrace, Asia Minor, Syria, and Egypt, from the Lower Danube to the confines of Persia; Honorius became, at least, nominal emperor of the west. The line which separated the two kingdoms was, in fact, much the same as that which now divides the empire of Austria from Turkey. The accession of Arcadius marked the final establishment of the empire of the east, which subsisted till the taking of Constantinople by the Turks, during a period of 1058 years.

Both of the sons of Theodosius were left under guardians. He had named Rufinus guardian of Arcadius, and Stilicho of Honorius. The very day appointed for the marriage of Arcadius with the daughter of Rufinus, the young emperor was, by a daring arrangement of the eunuch Eutropius, wedded to Eudoxia, daughter of Bauto, a Roman general, but by birth a Frank. Rufinus having been soon after assassinated by Stilicho's emissaries, Eutropius became prime minister; but in 399 was banished to Cyprus and beheaded, to satisfy the envy of the empress and the hostility of Tribigildus, leader of the Goths settled in Phrygia.

In the later years of his life Arcadius was entirely under the control of his wife Eudoxia, the persecutor of St. Chrysostom. Arcadius died 1st May, 408, leaving his empire to his infant son, Theodosius.

ARCESILAUS, a native of Pitane, a city of Æolis, was born B.C. 316, and died B.C. 241, at the age of seventy-five. He was the pupil of the mathematician Autolycus, his compatriot, and afterwards proceeded to Athens, where it was intended that he should devote his time to the study of rhetoric. Philosophy, however, had greater charms for him, and he became the pupil of Theophrastus the Peripatetic, and then of Crates. He also made himself acquainted with the sublime dialectics of the Megaric school and the scepticism of Pyrrho. He attached himself more particularly to the Academic sect, and be-

came one of their leading philosophers, though he introduced so many changes that he was considered the founder of what has been called the Middle, but more correctly the New Academy.

The New Academy would solicit our attention were it only for the celebrity bestowed on it by Cicero and Horace; but it has other and higher points of interest than those of literary curiosity. The combat of which it was the theatre was, and is, of singular importance. The questions connected with it are those vital questions respecting the origin and certitude of human knowledge, which have so long occupied the ingenuity of thinkers; and the consequences which flow from either solution of the problem are of the utmost importance. The Stoics endeavoured to establish the certitude of human knowledge, in order that they might establish the truth of moral principles. They attacked the doctrines of the Sceptics, and believed they triumphed by bringing forward their own doctrine of common sense. But the New Academicians were Sceptics, although their scepticism different from that of the Pyrrhonists; they affirmed that all things are incomprehensible—the Sceptics did not affirm that. Moreover, the Sceptics considered all perceptions perfectly equal as to the faithfulness of their testimony; the Academicians distinguished between probable and improbable perceptions. Assent is of two kinds: simple assent, which the mind yields with repugnance as without desire, such as that of a child following its master; and the assent which follows upon conviction and reflection. The Sceptic admitted the former kind, the Academicians the latter.

On the death of Crates, Arcesilaus filled the Academic chair with great ability and success. His fascinating manners won him general regard. He was learned and sweet-tempered, and generous to a fault. Visiting a sick friend, who he saw was suffering from privation, he slipped unobserved a purse of gold underneath the sick man's pillow. When the attendant discovered it, the sick man said, with a smile, "This is one of Arcesilaus' generous francs." He was of a somewhat luxurious temper, but he lived till the age of seventy-five, when he killed himself by hard drinking. Arcesilaus admitted with Plato the uncertainty of opinion; but he also admitted with Aristotle the incorrectness of the Ideal theory. He was thus reduced to absolute scepticism. The arguments of Plato had quite destroyed the certitude of sense-knowledge, and had set up in its stead the Ideal theory; the arguments of Aristotle had quite destroyed the Ideal theory. "And thus, by refusing to accept one argument of the Platonic doctrine, Arcesilaus could, from Plato's works, deduce his own theory of the incomprehensibility of all things; for according to the Academicians, all perceptions were *acataleptic*—that is, bore no conformity to the objects perceived" (*G. H. Lewis*, "Hist. of Phil." 1870).

Arcesilaus revived the Socratic mode of teaching; he propounded no dogmatic principles of his own, but discussed the points proposed to him by his pupils. He brought forward all the arguments that could be suggested on both sides of a question, and endeavoured to prove that there was no certainty in philosophical knowledge, and that in all purely speculative subjects we must refrain from coming to a decision, because the mind of man cannot sufficiently distinguish truth from falsehood. In the world, he admitted, we must act as others do. He was succeeded in his school by Lacydes, B.C. 241. The reader may consult the fourth book of Cicero's "Academic Questions" for an eloquent exposition of the arguments for and against the philosophical doctrines of Arcesilaus.

ARCH, the English form of the word *arch* (as "ditch" for *dyke*), is applied to any solid work, whether of masonry or otherwise, of which the lower part is formed into an arc of a curve supported at the two extremities.

of Tiryns, near Argos. A similar effect may be seen in the entrance to the Treasury of Atreus [see *PLATE ARCHITECTURE*], and to the Pyramid of Gizeh. The want of the arch would lead them to contract the intercolumniations, or spaces between the columns, and to adopt the general and frequent use of columns as the only mode of supporting a superstructure.

It is maintained that there are brick arches at Thebes in Egypt which belong to a very remote epoch—long prior to the occupation of that country by Alexander the Great. Minutoli ("Reise zum Tempel des Jupiter Ammon") has given two specimens of Egyptian arches, one of which is a false and the other a true arch. The first specimen is from the remains at Abydos in Egypt, where the roof has the appearance of an arch, but is formed by three horizontal stones, of which that in the largest which occupies the centre and lies over the other two; the three stones are cut under in such a way as to form a semicircle. The true specimens are at Thebes, on the west side of the river, near and behind the building which contains the fragments of the enormous statue. They are circular arches, and formed of four courses of bricks, and on the walls there are Egyptian paintings and hieroglyphics. Etruria seems to have been the first European country in which the arch was used. The great sewer of Rome, commonly called the Cloaca Maxima, is an arched construction of the king Tarquinius Priscus (about 600 B.C.), and still remains with hardly a stone out of place. It is, however, very curious to remark that this Tarquinius was a Greek, whose father had settled in Etruria and married an Etruscan wife. [See *TARQUINIUS*.] It was therefore under a Greek king that this distinctive feature of Roman work was first adopted, so far as we know.

The application of the arched structure is one of the most useful mechanical contrivances. By means of it small masses of burnt clay, and conveniently sized pieces of soft and friable sandstone, are made more extensively useful for the economic purposes of building than the most costly and promising materials were in the hands of the Greeks and Egyptians. Cellars are vaulted, subways or sewers are made to pass under heavy structures and along streets with certainty and safety, and secure and permanent aqueducts and viaducts are formed across wide, deep, and rapid rivers. The aqueducts at Rome are figured amongst our *PLATES* [*AQUEDUCT*]; and with the vast amphitheatres, theatres, and palaces of the Romans, whose mighty remains astonish us to-day, were all only made possible by the invention of the arch. Had the intervening ages done their duty, these structures would be even now in good repair and fit for their original purposes, as is indeed the case with some of the aqueducts at Rome.

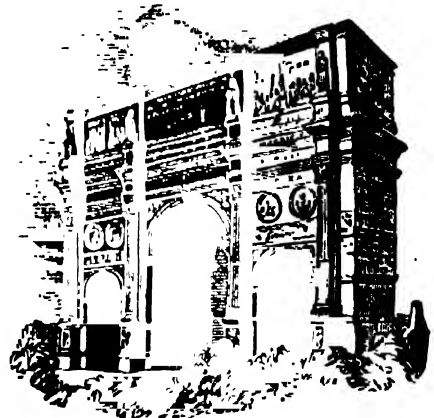
The Romans did not deviate much from the semicircular form. Arches of smaller segments were certainly used by them, as well as elliptical arches, but in these cases they were fortified with enormous abutments, which proves that the architects knew very well the weak points of such a construction. The architects of the twelfth, thirteenth, and fourteenth centuries showed what could be done by varying the form and construction of the arch. Especially elegant is the Moorish form, specimens of which, from the Alhambra and from Cordova, are amongst our *PLATES* [*MOORISH ARCHITECTURE*].

The origin of the pointed arch has been almost as much disputed as the discovery of the principle of the arch itself. It became general in most parts of Europe at nearly the same time, and about the period of the return of the warrior-priests and pilgrim-soldiers of the first crusade. This and other circumstances which might be adduced, added to the fact of the pointed arch being used in Asia before that period, and that an arch of the pointed form cannot be satisfactorily shown to have been used in

the northern and western parts of Europe anterior to it, give a reasonable degree of certainty to the supposition that the notion was brought from the East by the crusaders. Surpassing all the other forms in beauty it rapidly gained ground after its first introduction into Europe, and the utmost ingenuity of the architects of the middle ages was exercised in varying its form and application. Many fine examples will be found in our *PLATES* on *ENGLISH CATHEDRAL ARCHITECTURE*, taken from some of our greater churches and cathedrals; and we may observe the progress made from the simple semicircle through the segment and ellipse, the pointed, equilateral, lancet, and drop arches, and the more complicated trefoil, cinquefoil, and polyfoil forms, until they merge into the graceful *ogee* and the Tudor or four-cornered arch. Most of these will be readily found in the *PLATES*, as the peculiarity of shape is sufficiently indicated by the name.

ARCH, TRIUMPH'AL, a structure which the Romans used to erect across their roads or bridges, or at the entrance of their cities, in honour of victorious generals or emperors. Triumphal arches were of two kinds. Temporary arches were made of wood, on the occasion of a triumph. The others were permanent structures, built first of brick, afterwards of hewn stone, and lastly made of, or at least cased with, marble. Their general form is that of an oblong mass, with an opening in the longer side, and sometimes a smaller opening for foot passengers on each side of the large one. These openings are arched over with semicircular arches, and the fronts are decorated with columns and their accessories on lofty pedestals; the whole is surmounted by a heavy attic, on the faces of which inscriptions are generally placed.

Triumphal arches were erected under the republic; an arch of P. Cornelius Scipio Africanus (LIV. xxxvii. 3) is



Arch of Constantine.

mentioned as having been built on the Clivus Capitolinus. But under the emperors these monuments became very numerous, and were overcharged with ornaments. Augustus himself had several triumphal arches erected to him, of which the one at Rimini, where the Flaminian Way terminated, still remains, and serves as a gate to the town on the side towards Rome. It is 60 feet in height and 27 in depth of thickness; the gateway is 31 feet. An engraving of it will be found in the *PLATE BRIDGE*. Of the triumphal arches remaining at Rome that of Claudius Drusus Nero, the younger brother of Tiberius, is the oldest, erected about 10 B.C. This is on the Appian Way. The next oldest is that of Titus, at the foot of the Palatine Hill. This arch is ornamented with sculptures representing the triumph of Titus, and the ornaments of the temple of

Jerusalem which he brought as spoils to Rome. The exquisite column engraved in the Plates on ROMAN ARCHITECTURE, will give an idea of the beauty of this monument. But arches were also raised in honour of emperors for benefits conferred on their country on some particular occasions; such is the fine arch of Trajan on the old mole of Ancona. It is of white marble, and chaste in its style; the inscription states, among other things, that it was raised to Trajan for having at his own expense constructed the mole, and thus rendered the access to Italy on this side safer to navigators. These have one arched opening.

Two of the arches with three openings still exist at Rome; that of Septimius Severus, in the Forum, and that of Constantine, near the Colosseum. The latter is the most complete of all the triumphal arches at Rome. The style of Constantine's arch is, for the most part, superior to that of the age in which it was executed, as it consists mainly of the materials of a similar monument erected to Trajan. For more detailed drawing see the Plates to ROMAN ARCHITECTURE.

In modern times triumphal arches have been erected in France and Italy, in imitation of those at Rome. In London there are two triple arches; one known as the Marble Arch (situated at the top of Oxford Street, and which was originally erected in front of Buckingham Palace by George IV.), the other forming the entrance to the park at Hyde Park Corner.

ARCHÆOLOGY, literally "the study of antiquity or ancient things" (from *archaios*, ancient; and *logos*, a discourse). In its widest sense it embraces everything that pertains to the ancient life and being of a people, including the origin, language, history, manners and customs, and all that can be learned from the monumental and traditional remains of the past. In its narrower but more popular meaning it is restricted to the study, preservation, publication, and description of those materials from which a knowledge of the ancient condition of a country is to be obtained. Such a study of necessity admits of great subdivision, and many of its branches, such as ethnology, philology, mythology, palæography, hieroglyphics, numismatics, heraldry, &c., form almost independent pursuits. The study, which may be held to date from the revival of letters in Europe, was for a long time confined exclusively to Greek and Roman antiquities; but in later times attention has also been paid to those of ancient Egypt, Assyria, Judea, Etruria, India, China, Mexico, and to the scanty remains of the aboriginal inhabitants of North and South America. The discovery of the famous Rosetta stone, with its bilingual and trilingual inscription, which gave a key to the hieroglyphic writings of Egypt, opened up a vast field of study, which has proved wonderfully fruitful in its results. In another direction the labours of Layard, Rawlinson, George Smith, and others, in connection with ancient Assyria, have resulted in the most interesting discoveries, and have already thrown a flood of light upon many of the problems of ancient history.

The great attention paid to archaeology of late years has led to the formation of numerous associations throughout Europe, in order to unite the exertions of all who devote themselves to the study. The labours of these societies have been directed towards the preservation of those ancient monuments and inscriptions which have remained to the present day, the editing and printing of ancient chronicles, records, and charters, and the formation of museums for the collection and classification of antiquities.

The Society of Antiquaries of London was incorporated by royal charter in 1751, the Society of Antiquaries of Scotland in 1789, and the Royal Irish Academy in 1786. The latter have excellent museums of national antiquities. Another famous society is that of the Royal Society of Antiquaries of the North, which possesses a very valu-

able collection of antiquities at Copenhagen, arranged so as especially to illustrate prehistoric archaeology.

The progress of the study of archaeology has also been greatly assisted by the publication, at the expense of the state, of portions of the national archives, and the formation of museums by most of the nations of Europe. Of the latter the most celebrated are the British Museum in London, which has galleries of Assyrian, Etruscan, Egyptian, Greek, Roman, British, and Mediæval antiquities, and a vast collection of early manuscripts and books; the museums of the Louvre and Hotel Clugny at Paris, which also contain fine collections of Oriental, Classical, and Mediæval antiquities; and the museum at Naples, in which are displayed the vases, statues, paintings, utensils, fragments of food and clothing, &c., recovered from the buried cities of Pompeii and Herculaneum, one of the most interesting collections in the world, possessing, too, a sadly pathetic side from its fatal origin.

We may mention as the best book for obtaining a general acquaintance with the life of the ancients, the exhaustive work of Guhl and Koner, translated as "The Life of the Greeks and Romans," filled with illustrations from monuments and works of art, and as ingenious as it is accurate in its reconstruction of the every-day life lived in ages of the world now remote.

By the Ancient Monuments Act, passed in 1882, certain ancient remains in the three kingdoms were selected for special attention. The owners of these may empower the Board of Works to become guardians, to cleanse, fence, repair, and do whatever is necessary to preserve the remains for all time. The Act also conferred upon the Commissioners of Works the power to purchase any ancient monument to which the measure applied, out of moneys which may from time to time be provided by parliament for that purpose.

Prehistoric archaeology is a science of quite recent growth. The Danish antiquaries Nilsson, Worsaae, and Thomsen adopted the three ages of Lucretius, characterized by the use for tools and weapons of stone, bronze, and iron. Sir John Lubbock subsequently divided the Stone Age into two periods, on account of the discovery in Britain and France of human implements associated with extinct animals. There is no evidence that man existed in the Tertiary period; but in 1847 M. Boucher de Perthes found in Quaternary river-gravels at Abbeville the bones of extinct mammalia so mixed with flint tools as to suggest the inference that man existed in Europe at the same time as the mammoth, cave-bear, and woolly-haired rhinoceros. This inference has been confirmed by numerous subsequent discoveries. To this portion of the Stone Age, in which man used rude unpolished stone tools, Sir J. Lubbock has given the name of the PALÆOLITHIC PERIOD. The later, or polished Stone Age, was characterized by beautiful weapons and instruments made of flint and other kinds of stone, in which, however, there is no trace of any worked metal except gold, which was sometimes used for ornaments. This is called the NEOLITHIC PERIOD. Following this is the BRONZE AGE, in which the use of iron was not yet known, but bronze was employed for arms and cutting instruments of all kinds. Finally we have the IRON AGE, in which, though bronze was used for ornamental purposes, iron had taken its place for arms, axes, knives, &c. These "ages" form a classification of men according to the tools they used, and the degree to which they had advanced from the primitive condition; but it must not be supposed that one age suddenly displaced another. The "ages" are not chronological, but may have been in existence in Europe at the same period of time. See MAN.

ARCHÆOPTERYX (Gr. *archaios*, ancient; *pteryx*, a wing) is a fossil animal, remains of which have been found in the oolitic beds which compose the stone quarries of

Solenhofen, in Bavaria. The first discovery was a single feather. In 1861 the skeleton was found, and this is now preserved in the British Museum. There is at present in the Berlin Museum a second skeleton, which was lately discovered in the same place. This was examined by Carl Vogt, and pronounced by him to be a Lacertilian which had feathers. The more probable conclusion seems to be that the archæopteryx was a true bird, but marked a transitional period between reptiles and birds.

True teeth are found in position in the skull, though not found in any living bird. The hesperornis, however, an undoubted fossil bird, was provided with teeth very much resembling those of the archæopteryx. As is the case with fishes, the vertebræ, or separate bones of the spine, are biconcave—hollow in front and behind. [See ARTICULATION.] It is interesting to notice that the vertebræ of one undoubted bird, the ichthyornis, bones of which are found in the rocks of the cretaceous period, are biconcave. The archæopteryx presents marked characteristics of the bird class in the structure of the shoulder-blade and *furculum* or merry-thought.

The breastbone, according to Marsh, was broad, and a keel may have been present. The metacarpals (hand bones) of the wing are three in number, and are free, while those of all birds are united together by osseous matter so as to form a single bone. Professor Marsh, however, is of opinion that "in form and position these three bones are just what may be seen in some young birds of to-day. The bones of the reptile are indeed there, but they have already received the stamp of the bird."

The foot is that of a true bird, though the presence of deep grooves between the metatarsals (foot bones) would seem to imply that they were either free, like the metacarpals, or but imperfectly united. The tail is long and lizard-like, being composed of twenty separate vertebræ, to each one of which are attached feathers. This remarkable bird was about the size of a pigeon. The compsognathus, a dinosaurian reptile, the skeleton of which was found also at Solenhofen, shows the greatest affinity to the archæopteryx.

ARCH'ANGEL (from the Greek *archi*, chief; and *angelos*, an angel), a term used in the New Testament to designate an angel superior in power and glory to the rest. The conception of a hierarchy of angelic beings, having its gradations of rank and authority, orders, leaders, &c., had been fully developed among the Jews previous to the rise of Christianity, and according to one tradition there were seven holy angels who presided over the heavenly host, of whom Michael was the first; while another theory gave the number as four, who were named Michael, Gabriel, Raphael, and Uriel. These ideas current among the Jews appear to have been accepted by the primitive church, and such a hierarchy is repeatedly referred to in the New Testament, especially in the writings of St. Paul, who had been well taught in all Rabbinical lore (Romans viii. 38; Ephesians i. 21; Colossians i. 16, &c). The apostle also, in 1 Thessalonians iv. 16, refers to the second coming of the Lord as being accompanied by "a shout, with the voice of the archangel, and with the trump of God." Reference is also made in the Epistle of Jude to Michael the archangel; and in the Apocalypse Michael is spoken of as fighting at the head of his angels against the Dragon and his angels (Revelations xii. 7). It must be noted, however, that while the term is freely used in the plural in Christian literature, it is only used in the singular in the Scriptures. This fact, together with the high offices ascribed to the archangel, has given rise to a theory still maintained by a few theologians, that the title denotes the second person of the Trinity, but by the great majority it is interpreted in the way we have indicated.

ARCH'ANGEL, or properly **ARKHANGELSKOE**,

one of the nineteen provinces or governments which constitute that portion of the Russian dominions called "Great Russia," is not only the most northern but the most extensive province of Russia in Europe. It comprehends part of ancient Biarmia, Russian Lapland, the range of country inhabited by the Wainotan branch of the European Samoiedes, Nowia-Zemlya or Nova-Zembla, Waigatz, and other islands in the White Sea; and is divided into eight circles, namely, the city and dependencies of Archangel, Kholmogory, Shlenkursk, Pinega, Onega, Kem, Kola, and Mezen, each of which is named after its principal town. Its boundaries are, on the N. the White Sea and Arctic Ocean, on the S. the government of Vologda, on the E. the Ural Mountains, and on the W. Olonetz and part of Finland. The population in 1882 was 290,000; the area (not including the lakes, which cover a surface of about 6000 square miles) is 326,000 square miles. The northern part of the mainland in this province is situated within the frigid zone, and presents as desolate and sterile an aspect as the eye can dwell upon; this is particularly the case towards the east, where an immense tract of black soil, covered with moss, and crusted with ice for nine months in the year, is better known among the natives by the name of the "Tundri." South of the Tundri lie forests of pines, birches, alders, and willows. The province is in general a continuous flat, particularly that part of it which lies to the west, between the frontiers of Finland and the river Mezen; the only exception arises from the course of the Scandinavian range of mountains through the circle of Kem and Lapland.

The principal rivers of the province are the Dwina, the Onega, the Mezen, the Petschora the Outcha, and the Pinega. In the northern region the rivers are blocked by ice from October to May. There are also numerous lakes.

The climate of this province, particularly the northern districts, partakes of the extremes of heat and cold. The heat of the summer season is often oppressive; and the transition from heat to cold, on a change of wind, is frequently so instantaneous that a man who has been working in his shirt is forced to have immediate recourse to his fur cloak. But the climate becomes more intensely severe in proportion as we advance eastward.

The northern districts of Archangel are wholly uncultivable, and its soil, even in the south, does not yield grain enough for the support of its scanty population. The bread in use is a compound of meal, moss, scrapings of the bark of the pine, and grated roots; yet this food, coarse as it is, is unknown to more northern palates, which must be content with dried fish. The southern districts grow hemp and flax, and a few kinds of vegetables. The forests, which are the resort of bears, wolves, and a large variety of other wild animals, produce very fine timber, which is extensively made use of for the purposes of shipbuilding. Marine animals are largely captured in Nova Zembla; and the lakes and rivers yield abundance of fish. The country is well stocked with game; but domestic or farming animals are very limited in number and small, except in the region of Kholmogory, where excellent cattle are reared, which supply the delicate veal so much esteemed in St. Petersburg. Salt, gold, naphtha, and lignite constitute the minerals of the country. In some parts sulphurous springs are found.

In addition to the occupations of fishing and hunting, the manufacturing and mechanical industry of the people is principally confined to the preparation of pitch and tar and the weaving of linen, which latter industry fills up the leisure hours of the peasant's wife in the circles of Kholmogory and Archangel.

The population of Archangel is of Russian extraction in the proportion of about 95 to every 100; the remainder consists of about 7000 Samoiedes, 6000 Syriaenese or

Siriani, and 1700 Laplanders, besides a few Fins, who are domesticated in the circles of Ken and Kola. The tenets of the Greek faith are professed by all but a few thousand pagans.

ARCHANGEL, the capital of the above province, is the most northern emporium of trade in the Russian dominions. It stands on a low flat in 64° 32' N. lat., 40° 33' E. lon., 400 miles N.E. of St. Petersburg. The city extends about 2 miles along the right bank of the Dwina, and is 40 miles from the mouth of that river. It is not accessible to vessels of heavy burden, owing to the shallowness of the stream and a bar which runs across it, with only 12 feet of water, about 5 miles below the town. Archangel is the oldest port in the Russian dominions. It was founded in the year 1584, upon a spot previously selected as a home-stead by the members of a religious establishment, and takes its name from St. Michael, the archangel, the patron saint of Russia. In 1793 the greater part of it was destroyed by fire. From the time of its establishment to the foundation of St. Petersburg it was the only port in the Russian empire accessible to foreigners; and though it has lost its ancient importance it still enjoys a good trade, which is carried on as far as China, and most of the commerce of Siberia finds its way here. The exports consist chiefly of linseed, rye, oats, wheat, barley, flax, tow, tallow, train oil, mats, deals, buttons and ends, pitch and tar; also calf and seal skins, as well as beef and pork. The imports are oil, coal, wine, fish, sugar, coffee, spices, salt, woollens, hardware, &c. Its supplies of provisions are brought from a distance, as the soil in the neighbourhood grows no grain or vegetables, and breeds no cattle.

The port of Archangel is connected by canals with the Volga and the Neva. The navigation is open generally from June to the end of September, and during this period the river is covered with vessels and boats of all sizes. The town is ill-built, and the houses are chiefly of wood; the two main streets run in a zigzag direction parallel with the Dwina, and are connected by narrow lanes. The churches are eleven in number, ten Greek and one Protestant. The great bazaar or mart, surrounded by lofty walls, and the main hospital, are both composed of stone. The latter is a building of some extent, and open to foreign as well as native seamen. There are in the town a seminary for the education of ecclesiastics, academies for navigation and engineering, a magnetic observatory, a government bank, and gymnasium. Archangel is the seat of an archbishop, and the residence both of a civil and military governor. The population in 1882 was 20,000.

ARCHBISHOP. See BISHOP.

ARCHDEACON (Gr. *archi*, chief; and *diáconos*, servant) was the title originally given to the chief of the deacons in a metropolitan church. The office is one of great antiquity, as it can be traced back as far as the fourth century, and was probably in existence at a much earlier period. The duties of the archdeacon at that time were to assist the bishop in the management of the temporalities of the diocese, to attend upon him and assist him in the exercise of his episcopal functions, to superintend the work of the deacons, and to maintain the order and discipline of public worship.

Appointed thus in the first instance merely as assistants of the bishop, the archdeacons gradually attained greater power and influence, and in the ninth century became independent officials, and subsequently so extended their influence that the office became one of high dignity and authority in the church. This encroachment upon the jurisdiction of the bishop, however, was the subject of frequent protests, and the powers of the archdeacons were limited and restrained by several ecclesiastical councils held during the thirteenth and fourteenth centuries. In the Roman Catholic Church the dignity of the office gradually declined,

and it is now almost obsolete; but it has been maintained in the Church of England, where the archdeacon still exercises various functions.

According to the "Valor Ecclesiasticus" of King Henry VIII., there were then in England fifty-four archdeacons or districts through which the visitatorial or corrective power of an archdeacon extended, but the number has been considerably increased since that period, and at the present time there are at least two archdeacons, and sometimes three or four, in each diocese.

By the Act 6 & 7 Will. IV. c. 97, seven new archdeacons were established, and a new arrangement was made of all existing deaneries and archdeacons, so that every parish and extra parochial place should be within a rural deanery, and every deanery within an archdeaconry; and that no archdeaconry should extend out of the diocese. By a later Act (3 & 4 Vict. c. 27) all persons appointed to the office must have been at least six full years in priest's orders, and they are appointed by the respective bishops.

The duties of archdeacons are to visit their archdeaneries from time to time, to inspect the churches, so as to see that they are kept in proper repair, and that everything is done conformable with the decent performance of public worship. Also to hold annual visitations of the clergy and churchwardens of each parish, so as to ascertain that the clergy are in residence; to admit the newly-elected churchwardens, and to receive the presentment of those going out of office.

It is also the duty of an archdeacon to present all candidates for ordination to the bishop, and to induct the clergy of his district into the temporalities of their benefices after their appointment by the bishop.

Archdeacons may hold courts within their archdeacons for the hearing of minor ecclesiastical causes, and may appoint a judge to preside in their absence, who is styled "the official." From this court there is an appeal to the court of the bishop, or in the case of the archdeaconry of an archbishop to the Court of Arches. By the Act 3 & 4 Vict. c. 86, the archdeacon may be appointed one of the assessors of the bishop's court in hearing proceedings against a clergyman.

The emoluments of the office are small, and it is generally held by persons who have also benefices or other preferment in the church. The 1 & 2 Vict. c. 106, specially exempts archdeacons from the general operation of the Act, by permitting two benefices to be held with an archdeaconry. An archdeacon is, by virtue of his office, a member of the convocation of his province. Archdeacons are entitled to the style of "Venerable."

ARCHDUKE, a title superior to that of duke, which was claimed as early as the twelfth century by the dukes of Austria in order to mark their equality with the electoral princes, and their superiority over the other dukes of the empire. Though claimed and used by them, the title was not formally recognized until 1458, when it was conferred by the Emperor Frederick III. It is now taken by all the sons of the Emperor of Austria and their descendants through the male line. The daughters of the emperor are similarly styled archduchesses.

ARCHELAUS, the name of many distinguished men among the ancients.

ARCHELAUS the Milesian, an eminent philosopher of the Ionic school, and the last who was at the head of it in direct succession from Thales. He was the pupil of Anaxagoras. He removed to Athens about B.C. 450, where he became popular, and had Socrates and others among his hearers. He taught, like his master Anaxagoras, that everything was made up of small parts similar to itself, as wood of atoms of wood, metal of atoms of metal, bone of atoms of bone. He maintained that just and unjust are produced entirely by law; and that anterior to

law nothing is either one or the other. It appears probable that by law he meant solely human institutions.

(Diogenes Laertius; Brucker, "Hist. Philos." vol. i. p. 518; Fabricius, "Bibl. Gr.")

ARCHELAUS, son of Perdiccas, king of Macedonia, succeeded his father B.C. 418. The few notices of his reign refer mostly either to his private character or to his patronage of arts and literature. Euripides resided for some time at his court, and died there. Zeuxis visited him, and executed many pictures for his palace, which in consequence became a place of great resort for strangers.

The character of this prince, however, has been drawn in darker colours by Plato, who says that Archelaus was of illegitimate birth, the son of Perdiccas by a slave; that he gained the kingdom by a series of murders; and that his excesses led to his death by conspiracy (B.C. 399). He had reigned fourteen years. (Grote, "History of Greece.")

ARCHELAUS, an eminent general in the service of Mithridates, king of Pontus, and the opponent of Sulla when the Mithridatic war was carried on in Greece. During the siege of Athens he threw himself into the Piræus, and defended it obstinately (B.C. 87). Compelled at last to evacuate his stronghold, he retired northwards. After being twice defeated by Sulla, he received instructions from his master to make peace on the best terms which could be obtained. Eventually, being apprehensive of danger from the jealous temper of Mithridates, he went over to the Romans, by whom he was well received. (Appian, "Mithridatica;" Plutarch, "Life of Sulla.")

ARCHELAUS, son of the preceding, originally a priest, served in the expedition to Egypt of Gabinius, to reinstate Ptolemy Auletes on the throne; but having gained the affections and the hand of the usurper Berenice, the daughter of Ptolemy, under the pretence that he was the son of Mithridates, he went over to her party, and after a six months' reign was slain in battle against the Romans (B.C. 56).

ARCHELAUS, grandson of the preceding, received the kingdom of Cappadocia B.C. 36. He fought on the side of Antony at the battle of Actium, and yet he retained and even increased his kingdom under Augustus. Incurring the displeasure of Tiberius, as it is said, because he neglected the future emperor during his exile at Rhodes, he was summoned to Rome, where he died A.D. 17, apparently by a natural death brought on by age and infirmity. (Tacitus, "Ann." ii. 42; Dion, lvi.)

ARCHELAUS, son of Herod the Great. His father's last will declared him heir to the throne. Immediately after the death of Herod, A.D. 3, he assumed the regal power. The Jews, having long groaned under the yoke of Herod, received with joy the fair promises which the uncertainty of Roman favour extorted at the commencement of his reign from the policy of Archelaus. But before he received the imperial sanction, he showed his cruel temper by massacring a great number of the Jews in a riot; therefore, when he presented himself at Rome, and solicited the ratification of his power, his claim was opposed. The emperor gave a patient hearing to all parties. He decided the matter by placing only the districts of Judæa Proper, Idumæa, and Samaria, forming about half the dominions of Herod, under the government of Archelaus. The rest, with some small exceptions, was divided between Herod Antipas and Philip. Archelaus married Glaphyra, widow of his brother Alexander, by whom she had had children, which was a direct violation of the Jewish law. Weary of his tyrannical administration, in the tenth year of the reign of Archelaus the Jews again appealed to Augustus. The emperor dispossessed Archelaus of his authority, banished him to Vienna in Gaul, and confiscated his property. It is supposed that he ended his days in the place of his exile. (Josephus, "Wars of the Jews," from book i. chap. 28,

to book ii. chap. 8; and the "Antiquities of the Jews," book xvii.)

ARCHER FISH (*Toxotes*), a genus of acanthopterygious fishes, belonging to the family Squamipennæ, or those which are distinguished by having not only the soft parts, but often the very spines of the dorsal and anal fins, covered with scales like the rest of the body, and not always to be easily distinguished from them.

The *Toxotes jaculator*, which is found in Java and Sumatra, has been long celebrated for the singular instinct which it displays in catching flies and other insects which are its prey. When the archer perceives a fly or other insect resting on the leaves of the aquatic plants which overhang or swim on the surface of the stream, it shoots a single drop, not directly towards the insect, but obliquely upwards, in such a manner as to strike it in falling, thus preventing it from perceiving its danger and escaping in time. With such accuracy is the aim taken, that though frequently projected to the height of 4 or 5 feet, the drop seldom fails to hit the mark and precipitate the insect into the water, where it is, of course, within reach of the archer. The fish itself is of a yellowish colour, marked on the back with five brown spots.

ARCHERY, the art of shooting with bow and arrow. The use of the bow may be traced to the remotest antiquity; but some people, the ancient Britons for instance, did not use the bow. The first notice which we find of it is in Genesis xxi. 20, where it is said that Ishmael became an archer. In the Greek mythology we find Apollo and Hercules armed with the bow and arrow. In the war of Troy the main force of the Greeks appears to have consisted of soldiers who had heavy defensive armour; but the soldiers of Philoctetes were archers. Ulysses in the Iliad fights with the spear and sword, but in the Odyssey we find the strength of the suitors tested by the bow which Ulysses (Odysseus) had left at home, and which he afterwards uses against his domestic enemies.

In the later times of Greece archers formed a part of the light-armed troops, in the same manner as the Sagittarii among the Romans afterwards formed a part of the Velites. Procopius records it as a great improvement when the Roman auxiliaries were instructed to draw the right hand to the ear. But the practice itself is of much greater antiquity, as we see in the representations of the sea-fight on the walls of Medinet-Abou, at Thebes in Egypt ("Egypte, Antiq.," vol. ii.) It was also the fashion with the ancient Persians.

The time when the use of the long-bow commenced in England as a military weapon is unknown. That which the Normans used at the battle of Hastings was the arbalest or cross-bow, and in the reign of Henry III. we find cross-bowmen forming the vanguard of the army. As a military weapon of England, the arbalest, in all probability, was last used at the battle of Bosworth in 1405, though it was employed on the Continent in the wars of the sixteenth century.

From the reign of Edward II. the mention of the long-bow becomes frequent in our history. At Crecy, at Poitiers, and at Agincourt, as well as in several battles which were gained over the Scotch, the victory is ascribed to the English bowmen; and it is particularly noticed that at Crecy the rain, which had slackened the strings of the Genoese cross-bows, had not weakened the effect of the long-bows which our countrymen used. From this period down to the reign of Henry VIII. many acts of Parliament were passed to encourage the practice of archery, among which was one in the time of Edward IV., ordaining that every Englishman should have a bow of his own height; ordering butts to be constructed in every township for the inhabitants to shoot at on feast days; and imposing the penalty of a halfpenny upon every one who

neglected to use his bow. A statute passed in 33 Henry VIII. ordained that every man under sixty, except spiritual men, justices, &c., should use shooting with the long-bow, and have a bow and arrows continually in his house; that he should provide bows and arrows for his servants and children; that every servant above seventeen and under sixty years of age should pay 6s. 8d. if he was without a bow and arrows for one month. Latimer, in one of his sermons before King Edward VI., published in 1549, enforced the practice of archery from the pulpit. "In my time," he observes, "my poor father was as diligent to teach me to shoot as to learn me any other thing, and so I think other men did their children. He taught me how to draw, how to lay my body in my bow, and not to draw with strength of arms as other nations do, but with strength of the body. I had my bows bought me according to my age and strength; as I increased in them, so my bows were made bigger and bigger, for men shall never shoot well except they be brought up in it. It is a godly art, a wholesome kind of exercise, and much commended in physic."

The encouragement thus given to shooting with the long-bow caused archery to become a fashionable amusement after the bow had ceased to be used as an instrument of war. Edward VI. was fond of this exercise; and there seems every reason to believe that it was practised by Charles I., who issued a proclamation in the eighth year of his reign, to prevent the fields near London from being so inclosed as "to interrupt the necessary and profitable exercise of shooting." Public exhibitions of shooting with the bow were continued in the reigns of Charles II. and James II.

The Artillery Company of London kept up the practice of archery, but it did not revive as a national pastime until the close of the last century. In 1844 the Grand National Archery Society was started. This holds meetings at which both sexes compete. But perhaps the most important society of this kind now existing is "The Royal Company of Archers, the King's Body-guard of Scotland." The exact time of its institution is unknown, but it is referred by the Scottish antiquaries to the reign of their James I. The rank of the King's Body-guard for Scotland was understood from tradition to be vested in the Royal Company, and they accordingly claimed the honour of acting in this capacity to his Majesty King George IV. on the occasion of his visit to Scotland in 1822.

The distance to which an arrow could be shot from the long-bow depended much upon the strength and art of the Bowman; but, in general, the distance was reckoned from eleven to twelve score yards.

Ascham has enumerated fifteen sorts of wood of which arrows were made in England in his time. Of these asp and ash were preferred to the rest, the one for target-shooting, the other for war. Whistling arrows have been found on fields of battle of the time of Edward IV. They were chiefly used, it is believed, for giving signals in the night. The Chinese have used them from time immemorial. The arrows shot from cross-bows were usually headed with a large square pyramid of iron, and were called bolts and quarrels.

ARCHES, COURT OF, is the supreme court of appeal in the archbishopric of Canterbury. It derives its name from having formerly been held in the ancient church of St. Mary-le-Bow, which, from the fact of its possessing a very fine arched crypt was also called St. Mary of the Arches (*de Archibus*). It was removed about 1567 to the Common Hall of Doctors Commons, where the sittings were held until a comparatively recent period. Latterly it has had no settled place of judicature, though the sittings have been originally held at Westminster.

The acting judge of the court is termed the official principal of the Court of Arches, or more commonly the

Dean of the Arches. He is the deputy of the Archbishop of Canterbury, who is the judge of the court.

The Court of Arches has a general appellate jurisdiction in all ecclesiastical causes arising within the province of Canterbury. By the Church Discipline Act (3 & 4 Vict. c. 86) the power of the court to hear, in the first instance, such suits as are sent up to it by letters of request from the consistorial courts of the province of Canterbury was confirmed, and it was further empowered to accept letters of request from the bishops after they have issued commissions of inquiry, and the commissioners had made their report. By the same statute the Dean of Arches was empowered to sit as assistant to, or in the place of the judge of the Court of Admiralty in certain cases. The Dean of Arches is the only ecclesiastical judge who has power to pass the sentence of deprivation against a clerk in holy orders.

The appeal in former times from the Court of Arches lay to the Court of Delegates, or more strictly, to the king in Chancery (25 Henry VIII. c. 19), by whom the delegates were appointed to hear each cause, the appeal being to him as head of the church in place of the pope. The appeals are now by statute addressed to the king in council, and they are heard before the Judicial Committee of the Privy Council.

AR'CHIL or **OR'CHIL** is a blue dye procured from the *Roccella tinctoria* and *Lecanora tartarea*, and other lichens growing abundantly in the Canary and Cape Verde Islands. The colouring matter of these plants appears to be a peculiar vegetable principle developed in them by fermentation, that has been called erythric acid or erythrin ($C_{22}H_{20}O_{14} + H_2O$). It may be extracted either by means of alcohol or ammonia. Under the influence of air and ammonia these lichens yield archil only—a rich purple colour not durable, but very beautiful; if an alkaline carbonate is also present the product of the fermentation has a pure blue colour, and is then known by the name of litmus. Litmus is sometimes made into cakes. Dyers generally purchase it, however, in the form of moist pulp. The blue colour of litmus is due to the combination of the colouring matter with an alkali. If an acid be added the alkali is neutralized, and the natural red colour of the litmus reappears. Litmus is therefore used to ascertain the presence of acids in solution, because it has the property of changing from blue to red by contact with them; and it also detects alkalies by their restoring the blue which had been changed by acids. Archil is never used alone as a dye, on account of its want of permanence. It is, however, employed for the purpose of deepening and improving the tints of other dyes, and it imparts a bloom which it is difficult to obtain from other substances. Pliny mentions archil as being used by dyers to give a first tint to stuffs to be dyed with the costly purple. The use of the lichen was lost in western Europe till accidentally rediscovered by a Florentine in the beginning of the fourteenth century.

ARCHILOCHUS of Paros, one of the most famous of the Greek lyric poets, flourished about 700 B.C. (possibly 714–676 B.C.) He was descended from a noble family in Paros, but his mother was a slave; and the consequent slights he experienced are considered to be the cause why he always speaks of his native country with such bitterness. A maiden named Neobule had been promised him in marriage by her father Lycambes, and the promise broken (possibly from the circumstances mentioned above); on this Archilochus, who had already attained such proficiency as to gain a prize for his poetry, poured forth on Lycambes and his family the full force of his unequalled satire. That this was severe is shown by the fact that it passed into a proverb amongst the ancients. It is said that the daughters of Lycambes hung themselves from shame. With these bitter feelings urging him, Archilochus

accepted the leadership of a colony to Thasos. He soon broke with his comrades there, and proposed to settle in Sparta. He had, however, lost his shield in a fight against the Thracians, and had ventured to assert that it was better to lose one's shield than one's life; the brave Spartans accordingly would have none of him. (That is Plutarch's version, and is probably the correct one; but Valerius Max. asserts the refusal to receive the poet was on account of the bitterness of his writings.) He wandered to many places, finding happiness in none except at Siris, in Italy, and eventually returned to his birthplace, where he fell in battle.

The sarcastic poems called *iambics* were the great vehicle for the poet's expression; and he hit upon so successful a metre for this style of poetry, that the name *iambic* was at once applied to it. The old even stately roll of the hexameter, with its equal division of each foot into arsis and thesis (answering to our equal down and up beat in music), was abandoned for a springing measure (answering to our triple time in music), in which arsis was half thesis, or the reverse. So arose the measures of which the feet are — and — (the iambus and the trochee), and these combined into verses give the iambic trimeter and the trochaic tetrameter—a medium exactly suited to the play of brilliant satirical wit. A further extension of the same principle enabled Archilochus to construct the epode, where, as in the iambic foot the *syllables*, so here the *verses* are alternately long and short. Horace was an avowed imitator of Archilochus, and his epodes are amongst the most brilliant and polished of his poems.

But while the most striking characteristic of Archilochus was his bitter fierceness, we know that his poetry had better sides; for the epigram of Hadrian congratulates Homer that the Muses had led Archilochus to other fields than the epic, else his laurels would have been in danger; and Plato, whose own language is of perfect beauty, calls him "the most accomplished." The ancients in general rank the poet with Homer, with Sophocles, and with Pindar; but we have no means of judging for ourselves, since the fragments that remain are too few and unimportant. Such as there are may be found in Liebel's edition (Leipzig, 1812), and in Bergk's "Lyric Poets of Greece." A spirited English translation of some of them is in Merivale's "Anthology" (London, 1832).

ARCHIMANDRITE, the title of a dignitary in the monastic orders of the Greek Church, answering to that of Father Provincial among the monks and friars of the Roman Catholic Church.

ARCHIMEDES, the most celebrated of the Greek geometers, and one of the few men whose writings form a standard epoch in the history of the progress of knowledge, was born in Sicily, in the Corinthian colony of Syracuse, in the year 287 B.C. He was killed at the age of seventy-five, when that town was taken by the Romans under Marcellus (B.C. 212). According to Valerius Max., Marcellus had ordered his life to be spared, but Archimedes, intent upon a problem, neglected to answer the inquiries of the soldier seeking for him, and was killed. At his own request, expressed during his life, a sphere inscribed in a cylinder was engraved on his tomb, in memory of his discovery that the solid content of a sphere is exactly two-thirds of that of the circumscribing cylinder. By this mark it was afterwards found, covered with weeds, by Cicero, when he was residing in Sicily as *questor* (B.C. 75).

Archimedes, as Plutarch says, was related to Hiero, the second prince of that name. The reign of this prince lasted about fifty-five years, during the greater part of which Archimedes remained at Syracuse. The well-known story of Hiero's crown is as follows:—The king had delivered a certain weight of gold to a workman, to be made into a votive crown. The latter brought back a crown of the proper weight, which was afterwards suspected to have

been alloyed with silver. The king asked Archimedes how he might detect the cheat—the difficulty being to measure the bulk of the crown without melting it into a regular figure. While thinking on this matter, Archimedes went to bathe, and on stepping into the bath, which was full, observed the very simple fact that a quantity of water, *of the same bulk as his body*, must flow over before he could immerse himself. It immediately struck him that by immersing a weight of real gold, equal to that which the crown ought to have contained, in a vessel full of water, and observing how much water was left when the weight was taken out again, and by afterwards doing the same thing with the crown itself, he could ascertain whether the latter exceeded the former in bulk. For silver being, weight for weight, of greater bulk than gold, any alloy of the former, in place of an equal weight of the latter, would necessarily increase the bulk of the crown. In the words of Vitruvius, "As soon as he had hit upon this method of detection, he did not wait a moment, but jumped joyfully out of the bath, and running naked towards his own house, called out with a loud voice that he had found what he sought. For as he ran he called out in Greek, *Eureka! eureka!*" (I have found it! I have found it!)

The apophthegm attributed to him, that if he had a point to stand upon he could move the world, arose from his knowledge of the possible effects of machinery, and however it might astonish a Greek of his day, would now be readily admitted to be as theoretically possible as it is practically impossible. He is said to have travelled into Egypt, and while there, observing the necessity of raising the water of the Nile to pour which the river did not reach, to have invented the water screw which bears his name. [See *SCREW OF ARCHIMEDES*.]

After the death of Hiero, the misconduct of his grandson and successor, Hieronymus, provoked a rebellion, in which he was killed. The successful party sided with the Carthaginians, and the Romans accordingly despatched a land and naval armament against Syracuse under Appius and Marcellus. Among all the extraordinary stories which have been told of the siege, so much seems clear—that it lasted three years in spite of the utmost efforts of the besiegers; that this successful resistance was principally owing to the machines constructed by Archimedes; and that the city, after the siege had been some time converted into a blockade, was finally taken by surprise, owing to the carelessness of the besieged during the festival of Diana (B.C. 212). Polybius states that catapults and ballistæ of various sizes were successfully used against the enemy; that in their nearer approach they were galled by arrows shot not only from the top of the walls, but through port-holes constructed in numerous places; that machines, which threw masses of stone or lead of a weight not less than ten talents, discharged their contents upon the Roman engines, which had been previously caught by ropes; that iron *hands* (or hooks) attached to chains were thrown so as to catch the prows of the vessels, which were then overturned by the besieged; and that the same machines were used to catch the assailants on the land side and throw them to the ground. Livy and Plutarch give much the same account; but the curious story of setting on fire the Roman ships, at a bowshot's distance, by mirror is first mentioned by John Tzetzes and Zonaras, writers of the twelfth century, who cite Diodorus and others for the fact. Galen, in the second century, though he mentions that Archimedes set the enemy's ships on fire, says it was done with *puria*, which may refer to any machine or contrivance throwing lighted materials; and Polybius, Livy, and Plutarch are silent about it, which looks suspicious. But Buffon in the last century made experiments on the subject, and by a combination of burning-glasses produced surprising effects of fire at a distance.

The fame of Archimedes rests upon the extraordinary advances which he made, considering the time in which he lived, in pure geometry, in the theory of equilibrium, and in numerical approximation. In the first, by an axiom already mentioned [see *ARC*], by a similar one with respect to curved surfaces, and by the method of exhaustion [see *GEOMETRY*], he made as near an approach to the fluxional or differential calculus as can possibly be done without the aid of algebraic transformations. In the theory of mechanics, up to the time of the great Galileo, no further advance was made on the demonstration of Archimedes. Ptolemy records his successful calculation and observation of the solstices to determine the exact length of the TROPICAL YEAR. The ancients attributed to him more than forty mechanical inventions, among which are the orrery, the endless screw, the combination of pulleys, an hydraulic organ, according to Tertullian, and a machine called the *helix*, or screw for launching ships. This constant tendency to attribute inventions to Archimedes sufficiently shows the impression which his name left on posterity.

The works which have come down to us, of which the first seven are in Greek, are—1, two books "On the Sphere and Cylinder;" 2, "On the Measurement of the Circle;" 3, "On Conoids and Spheroids;" 4, "On Spirals;" 5, two books "On the Equilibrium and Centre of Gravity of Plane Surfaces;" 6, "Psammites," better known by its Latin name "Arenarius;" 7, "On the Quadrature of the Parabola;" 8, two books "On Bodies Floating in a Fluid." There is also a book of lemmas attributed to Archimedes. The works of Archimedes are written in Doric Greek, the prevailing dialect in Sicily. The text is for the most part in tolerably good preservation; the style is clear, and has been considered better than that of any of the other Greek geometers.

The best edition of the works of Archimedes is that of Joseph Torelli, published by the University of Oxford in 1792. There is a French translation by Peyrard (1809), and a German one, with notes, by E. Nizze (1824). The "Arenarius" [see *ARITHMETIC*] was translated into English by G. Anderson (London, 1784).

ARCHIPELAGO is the common term given to many clusters of islands. The group generally known by this name, when not qualified by some word prefixed, contains those islands which lie between the shores of Greece and Asia Minor, a description of which is given in the following article.

ARCHIPELAGO, GRECIAN, includes all the islands situated in the north-eastern quarter of the Mediterranean Sea; they are bounded by the shores of Bœotia on the N., Asia Minor on the E., and Negropont and Greece on the W., comprising a portion of sea having a length of 380 miles from Candia to the coast of Roumelia, and a breadth, from Negropont to the Asiatic shore, of 100 miles.

This sea was called by the Greeks and Romans the *Ægean Sea*, and the islands were distributed into two chief groups, the *Cyclades* and the *Sporades*. The former, which are to the east of southern Greece, are so called from their being supposed to lie in a somewhat circular form; and the latter—which are on the west of Asia Minor—from their being scattered in a long line. The chief islands in the *Cyclades* group are—Andros, Tenos, Myconos, Mios, Naxos, Paros and Antiparos, Amorgos, and Lymnæ. The *Sporades* include Scarpanto, Rhodes, Cos, Patmos, Nicara, Samos, Chio, Mitylene, Lemnos, Imbros, Sarcotrudæ, and Thasos. Many of the islands are of volcanic formation; others are composed almost entirely of a fine white marble, of which the Parian, from Paros, which was formerly most worked, is often mentioned by ancient writers. The productions of the islands are wine,

oil, gum-mastic, raisins, figs, silk, honey, wax, olives, and various fruits, especially the lemon and orange. Some of the larger islands contain sulphur, alum, iron, and other minerals. An extensive sponge fishery has also long been established among the *Sporades*, which are noted for their fine sponges. The commerce is very limited. In many of the islands they build vessels, but the construction is slight and not durable.

All the islands are thinly peopled, and some indeed may scarcely be considered inhabited. The men are a fine hardy and athletic race; and as their insular position renders them necessarily habituated to the sea they are generally good sailors. The women are noted for their beauty.

All the islands are high; the mountains have an average elevation of 1500 to 1800 feet, but Mount Elias of Milo rises to the height of 2500 feet above the sea. The climate is more equal than that of the surrounding continents, the heat of summer being tempered by cool refreshing sea-breezes and prevailing northerly winds; even in the more northern islands the winter is never felt with such severity as on the neighbouring mainland. In winter the navigation of these seas is an anxious task, on account of the numerous islands and rocks, which occasion sudden flaws and eddies of winds, and a short, high, confused sea.

The rivers which empty themselves into the Archipelago are more deserving of notice from their classical associations than from their magnitude or commercial importance; indeed the south-western shores offer no river navigable even for small boats. The Peneus, Axius, Strymon, Hebrus, Hermus, and Mæander are the principal streams. The coasts are deeply indented with gulfs of considerable length.

On the division of the Roman empire the islands formed a portion of the eastern dominion, and continued so till the year 1185, when the Venetians captured Andros, Lesbos, Samos, and Scio. In 1207 most of the islands fell into the hands of a Venetian noble, Marco Sanuto, who designated himself duke of the Archipelago. The sovereign power remained in his family till the sixteenth century, when the islands fell into the hands of the Turks. After this they were made the scene of many contests between the Turks, the Venetians, and the Knights of Malta.

In 1770 the Russians became masters of some of the *Cyclades*, which they evacuated by treaty four years afterwards. They remained tributary to the Porte till the breaking out of the revolution in 1821, shortly after which most of them eagerly embraced the cause of liberty, and contributed as much as lay in their power, both by men and ships, to the squadrons fitted out at Hydra and Spezzia. Their intrepid behaviour in their small vessels against the Turkish fleet became the admiration of Europe, and contributed greatly towards the establishment of their national independence.

All the *Cyclades* are now included in the Greek kingdom, but most of the other islands still remain under the Turks.

ARCHITECTURE. The Greek term for architect is *architectôn*, which we find employed by Herodotus (iii. 60) in the same sense as the word *architect* now is; he informs us that Rhoecus, a Samian, was the *architecton* or architect of the great temple of Samos. We thus learn from positive testimony that, before the great buildings of Athens were erected, the term architect and the profession of an architect were distinctly recognized among the Greeks. But Herodotus also uses the word *architectôn* in the same passage in another sense; he applies it to a person who made a tunnel by which the city of Samos was supplied with water; and this is an instance in which *building* or *construction*, properly speaking, can hardly be said to have been employed. The great increase in works of this class

in modern times has led to new designations, such as that of civil engineer, which we apply to those who construct artificial ports, roads, railways, tunnels, &c.; and though the engineer may often have occasion to *build*, and may also with propriety *decorate*, common usage has placed a determinate boundary between him and the architect.

Architecture is one of the fine arts, and it is also a constructive art. As one of the fine arts it has its principles, which have been developed in various ways in different countries; as a constructive art its character is determined by the various purposes for which buildings are erected, and sometimes by other causes—as the presence of fine marble in Italy and hard stone in England, &c. Those buildings only in which the æsthetic elements grow naturally out of the constructive, are true in style; and all such are alike true, however variously these elements may be expressed. This unity of design is to be found in every noble piece of architecture in the world, whether Egyptian, Greek, Roman, Byzantine, Lombardic, Gothic, or Moorish. The Pyramids, the Parthenon, the Colosseum, the Doge's Palace, the Tower of Pisa, Westminster Abbey, and the Alhambra, all arose directly out of the wants of those for whom they were designed, and the ornamentation that was applied to them either grew out of the material constructive elements, or was such as best expressed the uses or objects to which the structures were to be applied. Sometimes we could improve in the construction, sometimes we find the ornamentation not beautiful in itself, but such edifices, whatever their defects, are always noble because true and natural, and as in all things true and natural, so in pure architecture, we can find underlying principles on which the great builders have instinctively modelled their constructions. It says much for the present age that although as yet no distinctive or appropriate style exists, although we are mere copyists and imitators of dead styles, one day erecting a museum in the likeness of a Greek temple, and the next a warehouse after the pattern of a Venetian palace, or a town-hall which parodies a Gothic minster, yet we feel painfully our pressing need, and an earnest spirit manifests itself on every side in the search after these great principles. It is thought, and rightly thought, that if these can be discovered, then a basis will be laid for a true and living architecture of the future. With all their magnificence of decoration, our Houses of Parliament are, in a certain sense, shamed by the humblest Swiss chalet; we feel that the one is an imitation, whilst the other is a living reality.

Following the leadership of the chief art-critic of our time (Mr. Ruskin, in his "Seven Lamps of Architecture," "Stones of Venice," &c.) we are able to perceive some of these principles; which, accordingly, we may here set down in such brief style as our space permits.

Firstly, since mere building is not architecture, in the accepted usage of the term, but only such building as by its disposition or ornament has received somewhat of the sublime or beautiful, this special distinguishing (or, if you will, unnecessary) ornament should be rich either in labour or in material. Cast-iron decorations do not enrich, they impoverish a structure; and we cry shame upon a carver who stops short in his work at the corner lest he may do more than is sure to be seen. The ornament may be small in quantity or simple in design, but it must be in some way precious, it must be the best we have, and never at all bear marks of stinting for mere saving's sake. On the other hand, waste of work is utterly reprehensible in architecture as in anything else; and the Certosa at Pavia, covered with carvings more like those on Indian Ivory boxes in delicacy than like chiselled stone, is admittedly a blunder notwithstanding its beauty. It is not a delight but a pain to look upon, exposed to wind and weather.

Secondly, all good architecture is universally and abso-

lutely true. If a column seems to support an entablature it really must do so; if a panel is of wood it is not to be painted to imitate marble. No one who observes the intricate groining of the roof of Milan Cathedral to be modern painted work only, but feels that the painter has almost desecrated the building; and no one who discovers the marvellous fronts of Siena and Orvieto to be unrelated to the construction of their churches, but wishes that John the Pisan had not chosen that exquisite gable form, since there is no gable behind it. But here again we must admit gilding and marble-facing, for these deceive no one with their beauty; we all know that such masses of gold and such slabs of marble could not be employed in the solid. Even terra-cotta ornaments are always seen with pleasure, since every one is aware that they are cast, and no one mistakes them for carved work; but on the other hand, all imitation stone is quite inadmissible in a fine building, and who is there so devoid of taste as to admire stucco? There is no doubt that amongst the various causes of the ruin of Gothic art one was its want of constructive truth in dealing with stone work, the later architects quite losing sight of the necessity for it of rigidity of form, and exhausting their ingenuity in endeavouring to make apparently plastic that whose beauty is in its unyielding strength. Mouldings twist in and out, columns bend, everything becomes flexible, and stone design is lost.

Thirdly, we find the necessity of the *sublime* in a building which is to be truly noble. A precipice of wall, a sheer unbroken flank of tower, may be all we require; and often with great size we may almost trust to the sublime for effect, and disregard decoration. The Pitti or Strozzi or Palazzo Vecchio palaces at Florence will occur to the mind as examples of building which impose by their sheer strength. And on the contrary, the enormous size of St. Peter's is frittered away and broken up until we require to make some considerable mental effort to invest it with that grandeur which should by right surround it. The grand effect of Egyptian pyramids and palaces depends almost entirely on the vast surfaces of unbroken wall. One of the boldest efforts of architecture has given us the unrivalled beauty of the Doge's Palace at Venice, whose enormous flat wall is borne on two rows of arcades one above the other; we might say, realizing the sublime supported by the beautiful.

Fourthly, we find on examination that one secret of *proportion* seems to be the making one member of the composition larger than, or in some other way supreme over the rest. So we have the great middle mass of the cathedral front with the two towers one at each side, or we have the grand central mass of tower or dome, or we make the storeys of towers to vary in height, the topmost bell-chamber being the most important. And this principle, with its handmaid symmetry, runs through the smallest details of ornament as a vitalizing force, as well as in the main features of construction of the entire edifice.

These are some of the half-seen truths guiding those who have given us great buildings. And further, the present general article is perhaps the most fitting place to trace briefly the cause of our "plentiful lack" in these days of any architecture worthy the name. This is undoubtedly owing to the unfortunate direction taken by the great movement of the Renaissance. There were three living styles of great beauty: the Lombardic, of which the type is Pisa; the Venetian Gothic; and the Northern Gothic, nowhere better represented than in our own minsters. Either of these might have developed far beyond the limits it attained. But in the fifteenth century a flood of revivalism spread over all Europe with the awakening of cultured minds to the beauty of classic art, for so many centuries neglected. Every art was remodelled on classic principles, and architecture did not escape. Regardless of the fact that Greek

worship required an out-door and Christian an in-door ceremonial, churches in the fifteenth century and onwards were made to bear a vast unmeaning array of columns, perhaps a temple portico in front. But even the most enthusiastic admirer of Greek forms hesitated to complete the peristyle, and as a compromise semidetached columns as meaningless pilasters ornamented the side walls of buildings of every kind, and interiors were solely decorated in the same absurd fashion. Directly one perceives that these columns and pilasters are merely decorative, that the strength of construction is independent of them, their falsehood turns their beauty to bitterness. How different in the preceding centuries, when architecture was living and progressive; when men, so humble that their names have too often perished utterly, designed Gothic minsters which are miracles of beauty; when, too, their fellow-masons could chisel, each his window or his column, with just a few words of direction from the chief builder, quite independent of cut and dry lifeless plans, and free in every detail to give play to his own inventive fancy! We can almost point to the one great artist to whom the modern imitative style of architecture is due, and from whom our faulty system of intrusting the whole building, down to the minutest detail, to one man, has sprung. It was Brunelleschi, architect of the splendid dome at Florence. It reinforces what we have said above, to note that the foundations of this dome were laid by Arnolfo and Giotto, builders of the cathedral, but that not a line was left by them to show how they intended to roof over the great space. They knew that as they built ideas would come, and experience also. Brunelleschi spent some years at Rome, studying the dome of the Pantheon and the other great vaulted structures of the Romans; and the results of his studies were designs so beautiful as at once to change the taste of the age, and for ever to overthrow the pointed style in Italy. Venice only escaped, and she but for a time. Alberti followed Brunelleschi; and it is worth remark that both these great men were dead before our Henry VII. began to reign, and at least half a century before there was any building in England in other than the Gothic style. Bramante was a worthy successor (1444-1514); and as yet the newly revived art was, although imitative of classic forms yet not at all servilely so, but was full of vigour and life and fresh invention. Unhappily the next was an age of painters, and the style at once became decorative. It already showed signs of decay in the mighty hands of Michael Angelo, and its feeble life was crushed out by the ponderous dullness of the Madernos and Berninis of later times. Palladio truly revived it somewhat in his fine churches at Venice, but when an architect is bound to use only pillars of 10 diameters in height, and to use these for all the purposes of internal and external decoration, and is similarly tied in other parts of the ornamentation, he has forged fetters for himself that no ingenuity can free him from. New Palladio being born in 1518, when Michael Angelo was forty-four, he, like all the world, was twisted irresistibly in the grasp of that mighty master's genius, and art is the poorer by it. Our turn in England came later. Not till Palladio's follower, Inigo Jones, built Whitehall was the Renaissance introduced; but the style once seen it was adopted here even more eagerly than in other countries. It is true that Wick's great genius gave us St. Paul's; but from the Stuarts till our own day this is almost the one only building of original design of high artistic merit in the country.

We now are in the midst of conflict; it is an age of experiment in every direction except the classical—that at least has gone, we may hope for ever. We have yet to learn that architecture is not and must not be archaeology, but that it must arise from the needs of the hour. In fact, apart from the important consideration that the

Gothic style suited our country, rose to its highest perfection and endured to the last amongst us, it is as absurd to build Tudor Houses of Parliament as Greek or Roman churches for the use of nineteenth century folk. Gothic architecture is at least English and Christian, but it is an anachronism, and if it is to remain a mere imitation must perish. If it is to live it must develop in accordance with present needs.

We shall discuss under their several headings the chief points of the EGYPTIAN, GREEK, ROMAN, ROMANESQUE (including BASILICAN, BYZANTINE, and LOMBARDIC), GOTHIC (or Pointed), and MOORISH styles of architecture; with some remarks on CELTIC remains, and on CHINESE and ORIENTAL architecture, in their proper places. We shall also give a separate article on ENGLISH CATHEDRAL ARCHITECTURE. The principal styles will be illustrated by Plates; and this article may conclude with an account of the illustrations of a general nature which compose the Plate prefixed to the present volume.

Like all our fine arts, architecture comes to us from the Greeks, and it is to them we must look for the forms in which it originated for us. Mountaineers and dwellers in caves by the sea need no more habitations than the wandering Bedonin; but an agricultural people, tied to a churlish soil (lest by want of care no harvest come), soon seeks for some permanent shelter. It is not long before a race of artists like the Greeks feels the need of something more than mere shelter, and a fine art springs into existence. Even in the early times of the Atrides we have the structure of the Treasury of Atreus at Mycenæ near Argos, whereof we show the entrance in fig. 3. This, like the celebrated "Lion's Gate" hard by, and like the walls of Tiryns in the same part of Greece, is of what is called *Cyclopean* structure, in which gigantic blocks of stone are fitted accurately together without mortar or cement. The arch-like structure in all the three monuments named (shown in our Plate, over the lintel of the gateway) is very curious; it is remarkable that the true arch should not have been discovered by that nation which even at this early time (1000 B.C.) had developed so near an approach to it. No doubt the opening shown in our Plate would have contained a group like that of the "Lions" in its companion. The handsome pillar, fig. 4, was found close to the entrance.

We have no knowledge of any development of this Pelasgic architecture; and the Greeks seem to have made a second start in quite another direction. Vitruvius, writing on the art which we know as "classic architecture" in the time of Augustus, or of his immediate successor, describes as the probable primitive type of edifice the dwellings still used by the half-savage Colchians in his time. Modern Mingrelia represents Colchis very nearly, but that land is better known to us by the myth of the voyage of the ARGONAUTS thither, where the stormy Euxine laps the southern slopes of Caucasus. These people then still retained their savage habits, though in such proximity to the cultivated Ionians of Asia Minor; and Vitruvius tells us (Book ii.) that their dwellings were built by fixing trees side by side, upright in the ground, on the tops of which cross beams were laid forming a kind of ceiling, and on this a second storey would be similarly built if required. The roof was made by the meeting of four beams, one from each corner, in a central point, the sides of the pyramid thus formed being fitted in with boughs, and the interstices stopped by chips and clay. From this mode of building, actually existent in his own day, Vitruvius developed theoretically the magnificent temples of ancient Greece; and though his theory has been often fiercely attacked it is still held in such general favour that we feel bound to give the briefest possible sketch of it. The best attack on the theory is that of Wolff's "Essential Elements of Architecture;" and the most

spirited defence is that of Freeman ("Hist. Arch.," p. 102). The upright beams of the Colchian construction are shown in figs. 1 and 2 of our Plate, here developed into shapely columns. Along the tops of each row of columns forming a side of the building was placed a horizontal beam, in fact an **ARCHITRAVE**; and across from one side to the other stretched, at equal distances, the timbers which were to support the roof. The extremities of these timbers, ornamented simply with two grooves, show above the architraves of the sides as **TRIGLYPHS**, so called from the triple ridge of the ornament. (For uniformity's sake triglyphs were also introduced at both ends of the building, though here of course they did not represent the extremities of beams, as in the sides, but were merely added to carry out the scheme of ornament.) The cross beams, the ends of which form the triglyphs, were notched into the architrave for steadiness (*opæ*, notches), therefore the spaces between the triglyphs were called "between the notches." **METOPES**; and the whole division parallel with the architrave, formed by triglyphs and metopes, was called the **FRIEZE**. This **ENTABLATURE**, as the combined horizontal structure of frieze and architrave was called, upheld the roof, the projecting eaves of which formed the **CORNICE**, and the triangular ends of the roof gave the well-known and beautiful form of the **PEDIMENT**. Drops of water might fall from cornice or from triglyph in beating rain—these therefore we find in the form of *guttæ* (drops) beneath both of them. The ribbed bark of the primeval trunk artistically gives rise to the fluting of the column, and the large flat stone which would so appropriately take the weight of the entablature becomes the **ABACUS**. All these features are developed in the elegant Temple of Theseus, at Athens, which accordingly we have given in figs. 5 and 6. The plan (fig. 5) makes clear that the temple is "in antis" [see **ANTÆ**], and it is completely surrounded with columns in the manner named *peripteral*. Fig. 6 gives the end view, which is called the **PORTRICO**; and it forms a noble illustration of the true Greek or **DORIC ORDER**.

An excellent small general handbook of architecture is that of Rosengarten, 8vo (1878); Fergusson's Handbook, in three vols. (1855), is more complete, and is further developed in his "History of Architecture" (1873). A translation of M. Viollet le Duc's valuable lectures appeared in 1876. Mr. Freeman's History (1849) is a vigorous pleading for the Gothic style, and his later essays were collected and published in 1876. Mr. Ruskin's valuable "Seven Lamps of Architecture" (1849), "Lectures on Architecture" (1854), and "Stones of Venice," are almost too well known to need mention here. Their occasional extravagancies need blind no one to their inherent beauty and power.

AR'CHITRAVE (from a Greek word and a Latin one, meaning, when put together, *the principal beam*), is the lower part of any structure supported by pillars; in fact, the beam which rests upon the columns and joins them together, and on which the whole entablature (or horizontal part which comes immediately above the columns) rests.

AR'CHIVE or **ARCHIVES**, a chamber or apartment where the public papers or records of a state or community are deposited; sometimes, by a common figure of speech, applied to the papers themselves.

The word archive is ultimately derived from the Greek *archeion*, which seems, in its primary signification, to mean "a council-house or state-house," or "a body of public functionaries," as the Ephori at Sparta. (Aristotle, "Politic." ii. 9; and Pausanias, iii. 11.)

The Greek word *archeion* was introduced unaltered into the Latin language, to signify a place in which public instruments were deposited. The Latin word for *archeion* is *tabularium*.

In England the word archives is not used to indicate

public documents, except in figurative speech, as "the archives of the state," for the parliamentary journals, &c. Such documents are called charters, muniments, records, and state papers. See **RECORDS**.

AR'CHIVOLT, means literally the *turning of the arch*, and is applied to any ornamented band or moulding which runs round the edge of the arch, being carved therefor on the lower part of all the voussours.

AR'CHON, a Greek word, which signified one who had rule or command, either civil or military. Archon was also the title of certain magistrates of the Athenians.

On the abolition of regal government at Athens, the chief power was intrusted to a single magistrate, or archon, appointed for life and chosen from the family of Codrus, the last king. Tradition told of twelve archons in succession, after which the chief magistrate was appointed to his office for ten years. The duration of the office was eventually limited to a single year, and a council of state, consisting of nine magistrates or archons (sometimes mentioned by the Greek writers under the general designation of "the Nine"), was appointed from the general body of Patricians. Their names and number, and the particular civil duties assigned to them, remained unaltered whilst Athens continued to possess its old constitution; but from the time that the ecclesia, or popular assembly, interfered habitually and directly with the government of the republic, the actual minister of state was the person who enjoyed the confidence of the people, which neither the office of archon nor any other office could procure. The inevitable consequence was, that the archons sunk from ministers of state into municipal officers of high rank. Pericles enjoyed a degree of power which was not possessed during the freedom of the republic by any other citizen, although he was never archon.

Later on, under Solon's laws, introducing a property qualification, the archons were taken from the wealthiest class of citizens, the noblest families probably still continuing chiefly to supply the archons for each year, till the celebrated law of Aristides, enacted about B.C. 479, threw open the offices of state to the whole body of the people. (Plutarch, "Aristides," c. 1-22.)

Of the nine archons, one, usually termed *the archon*, was chief, and had the title of *eponymus* or name-giver, because the year in which he served the office was called by his name. Of the remaining eight, one was called the king (*basileus*), another the *polemarch*, and the last six had the general title of *thesmothetæ*. There is reason to believe that the archons were members of the council of Areopagus by virtue of their office. [See **AREOPAGUS**.] It is certain that they passed from their annual magistracy to a permanent seat in that council.

Their public duties had reference for the most part to the administration of justice. The chief archon was the guardian of orphans and minors. He was also charged with a more general superintendence, in matters which concerned the safety and good order of the state, than was committed to his colleagues. The king archon was more especially concerned with religious matters. The office of the polemarch was doubtless in its first institution that which the name implies, to command in war; and even as late as the battle of Marathon (B.C. 490) we find the polemarch Callimachus acting an important part in the council of war which preceded it, and commanding by virtue of his office the right wing of the Athenians in the engagement; but in later times the duty of the polemarch was confined to the cognizance of matters which concerned the strangers and *metics* (resident aliens) at Athens.

The *thesmothetæ* should, according to the meaning of their title, have been legislators or proponers of laws. It was not, however, their office to introduce laws, but rather to revise the existing laws annually. They also

acted as a sort of Grand Jury, or inquest, to bring cases before the Dicasts or judges.

The title of archon is frequently used by Greek writers to designate magistrates in general, and it was given by the Jews during the period of the Roman dominion to the members of the Sanhedrim. The name was also used metaphorically by some of the sects of the Gnostics, who were called from its use Archontics.

ARCHYTAS OF TARENTUM, one of the most illustrious of the ancients, and distinguished as a mathematician, writer on music, and philosopher, as well as a statesman and general, flourished about 400 B.C. He was a contemporary of Plato, whom he befriended and instructed. He was seven times elected general of the city, and is said to have been victorious in every campaign he undertook. In the civil administration he was no less fortunate, and he ever maintained the highest character for integrity and benevolence. In his philosophy he was a Pythagorean. According to Diogenes Laertius he was the first to reduce mechanics to scientific principles, and was the inventor of the method of analytical geometry. He solved the problem of the doubling of the cube, and was so skilled as a mechanician that his contrivances caused him to be regarded almost as a magician. Of the various machines he constructed, the most celebrated was that of an automatic flying bird. On the authority of Horace (Book I., Ode 28), he is believed to have lost his life by shipwreck on the coast of Apulia. A complete edition of the little that is attributed to Archytas was published by Oreilli at Leipzig, 1821, and has been published since by Hartenstein in 1833, and by Gruppe in 1840. An English translation by Thomas Taylor was published in London in 1822.

AR CUIS-SUR-AUBE, the chief town of the arrondissement of the same name, in the department of Aube, France, 18 miles N. of Troyes. The town stands well for trade, being situated on the Aube, which here begins to be navigable, and by means of which it has communication with Paris. Wine, charcoal, corn, and other agricultural produce, together with iron and the wooden wares of the Vosges, are the chief articles of trade. There are also some establishments for cotton spinning and dyeing. The town has an ancient origin, but has suffered much from fire, especially in the year 1814, when a battle was fought near it between Napoleon I. with a small force, and the allied armies of Austria and Russia, numbering 80,000. It still, however, possesses a church dating from the sixteenth century, and an old castle on a neighbouring height. The modern houses are well built, and the streets wide. Danton, so prominent a figure in the French Revolution, was a native of the town. The population in 1882 was 3000.

AR COLÉ, a village of Northern Italy, about 15 miles E.S.E. of Verona, in the province of the same name. It lies in the midst of a low marshy country, through which flows the Adige, a torrent rising in the mountains near Vicenza, and emptying itself into the Adige about 3 miles below Arcole. The village is only remarkable as having been the scene, in 1796, of one of the hardest-fought battles in all the Italian campaigns of Bonaparte, which lasted three days, and ultimately resulted in a decisive victory for the French. See NAPOLEON.

ARCON, JEAN CLAUDE D', born at Pontarlier in Franche Comté, in 1733, showed an early inclination for the military profession. He became an expert engineer, and wrote several treatises, among which may be enumerated, "Correspondence sur l'Art de la Guerre," and "Réflexions d'un Ingénieur en Réponse à un Tacticien" (1760, Amsterdam, 1773). In 1770 the war of France and Spain against England gave him an opportunity of displaying his talents on a larger scale. The Spaniards were besieging Gibraltar without success, when D'Arcon devised

a plan of attack, by means of floating batteries which were to be incombustible and not liable to sink. This scheme was acted upon, and great expectations were formed, many persons of rank attending to witness the astounding effects of which they were said to be capable. It was, however, found, to the dismay of the besiegers, that these batteries were not incombustible. The attack was defeated, with their utter ruin and great loss. D'Arcon afterwards served in the French army at the time of the Revolution, and assisted in the conquest of Holland. In 1795 he published "Considérations Militaires et Politiques sur les Fortifications," in which he condensed all that he had previously written on the subject. He was made a senator in 1799, and died the following year at his estate near Autenil. (Coxe's "Memoirs of the Kings of Spain of the House of Bourbon;" and Drinkwater's "Siege of Gibraltar," &c., London, 1785.)

ARCOT, a considerable district and town of British India, forming part of the CARNATIC, lies between 11° and 14° N. lat., 78° and 80° E. lon., in the Madras presidency. The territory thus named is subdivided into the two districts of Northern and Southern Arcot, both of which were ceded to the East India Company in 1801 by Azim-ul-Omrah, nabob of the Carnatic.

In the spring months, during the prevalence of the hot winds, the thermometer sometimes stands at 115° to 130° in the shade. The heat is so intense that everything warps, glass cracks, and both the woods and jungle are occasionally set on fire by spontaneous combustion. The agriculture depends to a large extent upon irrigation, and for this purpose the water is collected in numerous tanks, some of which are very large.

NORTHERN ARCOT is bounded on the N. by Cuddapah and Nellore, on the S. by Salem, on the E. by Chengalpat, and on the W. by Mysore. It comprises an area of 7139 square miles, and had a population of 2,100,000 in 1881—the majority of whom, as well as in Southern Arcot, are Mohammedans. The ordinary peasants still live in mud huts, except in the towns, where stone houses are not uncommon. The country is hilly in the north and west, but generally flat elsewhere, except in the extreme south-east, where the Jawadi range, covered with valuable timber, reaches a height of 3000 feet. The Eastern Ghats intersect the district from N.E. to S.W., and the Nagari Hills traverse the north. Copper and iron abound, as well as lime and good building stone. The principal river is the Pálar, with two important tributaries, the Poiny and the Cheyair, all of which run dry except in the rainy season. Grain crops are raised, and cotton, hemp, indigo, sugar, and tobacco are extensively grown. Only 5 per cent. of the land is under cultivation, but three-fourths of the whole is irreclaimable waste. The ordinary food of the people is porridge, rice being only eaten as a regular thing by the rich. The district, which is traversed by railway, exports food, grains, and molasses. Cloth is imported, and there is a transit trade in cotton. The chief industries are weaving. Small-pox is prevalent from February to May; leprosy is common, and malarious fever occurs in many parts.

SOUTHERN ARCOT has an area of 4878 square miles, and a population of 1,800,000 in 1881. Its boundaries are on the N. Chingleput and Northern Arcot, S. Trichinopoly, E. the Bay of Bengal and the French district of Pondicherry, and W. the district of Salem. Near the sea-coast the aspect of the country is low, but on the west frontier occurs the Kalrayan range, with an average height of 3500 feet, in addition to the Jawadi mountains mentioned above. The Coleroon, which runs along the southern boundary, is the most important river, and for most of the year has an abundant supply of water. Other streams are the Vellar, Gaddilam, and Panniar. There are considerable tracts of jungle land, on which large herds of cattle

are annually driven to graze. In both districts the elephant, bear, tiger, hyena, monkey, and deer are met with. The seaports of Southern Arcot are Fort St. David or Cuddalore, and Porto Novo. The soil is productive to a much larger extent than that of Northern Arcot; over one-third is cultivated, rice being the chief grain sown. Other products are indigo, tobacco, sugarcane, and fruit. Some extensive cloth manufactures, established by the East India Company, have considerably fallen off, owing to the introduction of European goods. Salt is manufactured, as well as silk, pottery, and spirits; and fisheries are carried on. Iron ore is found, and there are considerable quarries of sandstone, laterite, and blue limestone. A railway from Madras to Porto Novo was opened in 1878. The average rain-fall is 85·10 inches. Violent storms are frequent on this coast.

ARCOT CITY, formerly the Mohammedan capital of the Carnatic, is built on the south side of the Pálar, and is of very great antiquity. It is 65 miles from Madras, and 5 from Arcot Railway Station. The European quarter, Ranipet, on the opposite side of the river, is nearer the railway. Arcot played a prominent part in connection with the British conquests of India, and is remarkable for its brilliant capture and subsequent defence by Clive in 1751. The English were besieged by Raja Sahib, but their gallant defence against vastly superior numbers for fifty days has become a matter of history, and is immortalized by the pen of Macaulay. Later on the French gained possession of it, only, however, to yield it again to a British force under Colonel Coote in 1760. After the cession of the district of Arcot to the East India Company the principal defences of the place were all destroyed, and the only use now made of the ramparts is to constitute a defence against the inundations of the Pálar, for which purpose alone they are kept in repair on that side of the city. The bed of the river is here half a mile wide. The town, which is inclosed by walls, is almost entirely of modern erection. It contains the palace of the former nabobs of Arcot; the chief gateway is entire, but the rest of the building is a heap of ruins. There are several fine mosques and a collection of tombs. The climate of Arcot, which is the capital of the district of Northern Arcot, is hot and dry. Rice is exported to a small extent, and bangles are manufactured. The principal inhabitants are Mohammedans, who speak the Hindustanee dialect. The population of the town amounted to 160,000 in 1881.

ARCTIC CIRCLE. To the Greeks the constellation **ARCTOS** (the Great Bear) just swept the horizon in its course, never sinking below it, and the imaginary circle round the heavenly pole thus made was called the *arctic* (or bear's) circle. But in the modern use the term has been shifted to the earth, and now means the parallel or circle of 70° N. lat., and the space included between this and the North Pole. The corresponding South Polar Circle is called the *Antarctic* ("opposite to Arctic") Circle.

ARCTIC OCEAN is usually described as stretching from the Arctic Circle towards the North Pole. Its waters extend along the northern coasts of Europe, Asia, and America, and communicate with the Pacific by Behring Strait, and with the Atlantic principally by a broad expanse of ocean on the east side of Greenland. It is designated the Polar Sea in North America, where it forms Baffin's Bay, while in Europe it forms the White Sea, and in Asia, along the shores of Siberia, the Gulfs of Kara, Obi, and Yenisei. The principal rivers which flow into the Arctic Ocean and its various inlets are, in Europe, the Onega, Dwina, and Petchora; in Asia, the Obi, Yenisei, and Lena; and in North America the Mackenzie.

That part of the Arctic Polar Sea where it borders on the Atlantic contains one of the largest archipelagos on the globe. The middle of it is occupied by Greenland,

which may be considered as the mainland of the archipelago. Its northern parts are buried under enormous masses of eternal ice. On the east of it is the extensive group of islands known under the name of Spitzbergen, the small island of Jan Mayen, and Iceland. On the west of Greenland, and divided from it by Davis' Strait and Baffin's Bay, there is a considerable number of islands of great size, some of which are separated from the mainland of America by very narrow straits.

The difficulties of navigation, even were there not the fields of ice—which in summer are shifting—would be very great and attended with great danger, owing to the intricate nature of the coast and channels.

Notwithstanding the excessive cold of these latitudes, there is an abundance of animal and vegetable life. The polar bear, Arctic fox, musk-ox, walrus, whale, lemming, ermine, and reindeer are found; and large flocks of birds from more southern latitudes resort thither in summer. Dwarf rhododendron and other shrubs, as well as numerous specimens of mosses and lichens, represent the vegetable kingdom.

Geologists have ascertained that in former times the surface of this region was thickly covered with a prolific growth of tropical plants, and that lower down there exist deposits of coal, sandstone, and limestone, in which fossils have been found. The bones of the mammoth found on the coast of Eastern Siberia form an article of traffic. For information respecting the currents the reader is referred to the article **ATLANTIC OCEAN**, while the accounts of the various explorations in this part of the world will be found in the articles **NORTH-WEST** and **NORTH-EAST PASSAGES**, and **POLAR REGIONS (NORTH)**.

ARCTOMYS. See **MARMOT**.

ARCTOS (Gr. *arktos*, a bear), the ancient Greek name still borne by the two great constellations close to the North Pole in the heavens, and described under **GRAND BEAR**. The constellation of the Great Bear was also called *hamaza*, "the waggon;" a view of the group which gives the English name, "Charles' Wain." Yet another title was the Latin *septem triones*, or "seven ploughing-oxen" ("the plough" is still its name in some parts of England), shortened into *septentrio*; which name being eventually given to both major and minor "bears," came to be so connected with the north as to be adopted altogether for that point of the compass. *Septentrio* and *setentriona* are the modern French and Italian derivatives, still used in those languages for the North. The Great Bear was also called *helikē* ("the curving"), from its close sweeping curve round the pole. It was used by the Greeks as their guide for steering at night, but the Phœnicians (better astronomers) used the Little Bear, whence another name for the latter, *phoinikē*, the "Phœnician" (pole). The last name we shall here mention is still in everyday use, for when we speak of such and such a person or thing being the "cynosure of all eyes," we are simply using the ancient Greek name for the Pole Star, which seemed to them like the tip of a curly "dog's tail" (*kynosoura*).

The bear constellations represented in Greek mythology the nymph **CALLISTO** and her son **ARCTAS**.

The constellations will be found as **Ursa Major** and **Ursa Minor** in our large **PLATE CONSTELLATIONS**, lying in the North Hemisphere, close to the Pole Star (*Stella Polaris*), which is in the centre.

ARCTURUS, a very brilliant star in the northern heavens, in the constellation **Bootes** (**PLATE CONSTELLATIONS**, N. Hem., just over **xiv.**) It was originally one name of the constellation, from its position as to the Great Bear—*arkturos* meaning "bear-watcher"—but has come to denote only its chief star. The other name—now the only name for the constellation—occurs in Homer, and pictures *Bootes*

("the herdsman"), as driving the "waggon"—the latter being another figure which the stars of the Great Bear have been imagined to form. See ARCTOS, CALLISTO.

ARCY, GROTTO OF, a singular cavity in a hill in the department of the Yonne in France, about 3 miles south of the little town of Vermanton. A narrow path over a hill covered with wood conducts to the entrance of the grotto, which contains a number of large apartments, one of which is 1200 feet long, 40 wide, and 85 high; but they rarely rise to the height of 20 feet. In the first two apartments are found large blocks of stone lying on the ground; and in the second there is also a pool about 120 feet in diameter, the waters of which are clear and fit for drinking. The apartments further in are distinguished by the number and variety of concretions which either hang from the roof (*stalactites*), or rise like columns from the ground (*stalagmites*). They are formed by the water which filters through the over-arching rock, and forms a deposit about the orifice from which it issues, as well as on that part of the ground on which it drops. As the concretions rising from below are exactly under those hanging from the roof, they tend to unite, and many of them have met, and form pillars which appear to support the roof. From the constant increase of these concretions the dimensions of the grotto are daily diminishing, and it has been calculated that in 200 years the whole cavern will be filled with solid alabaster.

ARD, LOCH, a small but beautiful lake near Aberfoyle in Perthshire, forming one of the sources of the river Forth. On an island stand the ruins of a castle said to have belonged to Murdoch, duke of Albany. The Lédard, a cascade mentioned in "Rob Roy," falls into the loch, on the east side of which is a remarkable echo.

ARDAGH, a small village in Ireland, about 10 miles S.E. of Longford. It was formerly the seat of a separate bishopric, but is now included in the united bishopric of Kilmore, Elphin, and Ardagh. It contains an ancient church. There are several other parishes of the same name in Ireland.

AR'DEA. See HERON.

ARDECHE, a department of France, which consists of the former province of Vivarais, and includes the northern part of the ancient Languedoc. It is bounded E. by the Rhone, which separates it from the departments of Isère, Drôme, and Vaucluse, S. by the department of Gard, W. by that of Lozère, and N.W. by those of Haute-Loire and Loire. The department extends between 44° 16' and 45° 21' N. lat., and between 3° 50' and 4° 50' E. lon.; its length is 74 miles, and its breadth 41 miles. The area of the department is 2134 square miles. The population in 1822 was 376,867.

Except a narrow strip along the right bank of the Rhone, the department is almost entirely covered by the Cévennes Mountains, in which there are several conical mountains and craters of extinct volcanoes. There are also several basaltic columns, and vast caverns and deep ravines in the department. The climate varies with the situation: in the west it is extremely cold; oats and barley ripen with difficulty, and the winter generally lasts eight months. The temperature of the valleys in the north is milder, and in the valley of the Rhone the climate is very hot. The soil, which is generally sandy and light, affords a great variety of productions according to its greater or less elevation. In the scattered valley of the Rhone the olive is cultivated as far north as the Erioux. Throughout the whole valley the vine and the mulberry flourish. Further west, and at an elevation higher still, there is a district in which beech, oak, and fruit trees, especially sweet chestnuts, abound. The chestnut forms the ordinary food of the peasantry; it is grown in immense quantities in the great forests west of the Ardèche, and is

exported under the name of *marrons de Lyon*. In the next higher regions the resinous trees, fir, larch, &c., prevail; and on the high table-lands of the main ridge of the Cévennes, where the snow lies for six or eight months, no vegetables live but Alpine plants.

The highlands of the department contain much pasture, to which the flocks and herds of the neighbouring departments are sent to graze. Butter and cheese are made in great quantities. Sheep and swine are numerous, also horned cattle, but these are of inferior breed; ponies and goats are reared, but the beasts of burden usually employed are asses and mules. The inhabitants in the rural districts retain their provincial manners, and go about barefooted. They are laborious and persevering, and in many places make even the mountain sides productive by building terraces to support the soil. This is particularly seen in the neighbourhood of L'Argentière. The manufacturing industry of the department is important. There are numerous tanneries for shoe and glove leather, paper-mills, cotton, woollen cloth, and silk factories. Great attention is paid to the rearing of silkworms. The department contains mines of lead, copper, iron, manganese, antimony, alum, and coal. Marble of different colours, porcelain clay, and pumice-stone abound. There are several mineral springs. Those of Val, near Aubenas, and St. Laurent-les-Bains, in the west of the department, are the most frequented.

The rivers of the department run from W. to E., with the exception of the Loire and the Allier, which rise in the south-western slopes of the Cévennes, and flow to the N.W. They are the Ardèche, with its affluents the Baume and the Chassezac, the Erioux, the Doux, and the Cance. The Ardèche rises in the range of Tanargue, and falls into the Rhone near Pont-Saint-Esprit, after a course of about 65 miles, the lower part of which separates the departments of Ardèche and Gard, and is navigable. The upper course of the Ardèche is diversified by several fine cascades. Below Vallon the river has cut its way through the marble rock, leaving a natural bridge (Pont-de-l'Arc) 196 feet wide between the abutments and 98 feet high. The arch, which crosses the river obliquely, consists of a mass of gray marble about 50 feet thick. It was formerly fortified, and formed the usual passage between the Cévennes and Vivarais till the time of Louis XIII., who demolished the fortifications, and made the bridge almost impassable. The Erioux rises N. of Mont Mézenc, and falls into the Rhone after a course of 36 miles. It divides the department into two districts, which are still called Haut Vivarais and Bas Vivarais, the former N., the latter S. of the Erioux. The Doux and the Cance are N. of the Erioux. They also rise in the Cévennes, and fall into the Rhone.

The department is divided into three arrondissements—Privas, L'Argentière, and Tournon. The capital of the department is Privas. The brothers Montgolfier and Cardinal Tournon were natives of Ardèche.

ARDEE, a market town in Ireland, in the county of Louth, 12 miles N.W. of Drogheda, is situated on the N. side of the small river Dee, which is here navigable for boats. It appears formerly to have been a place of some importance, but now consists of one main street, with several lanes branching from it. There are remains of two ancient castles, one of which, built by Roger de Pippart, an English settler, has been fitted up as a court-house. The town was burned by Edward Bruce in 1315, when the Augustinian and Carmelite Friary was almost entirely destroyed, and it again suffered from fire in 1688. It afterwards came into Cromwell's possession, and was subsequently held by the troops of James II. and William III. in succession previous to the battle of the Boyne. The church, which originally belonged to a monastery, is a plain building, and there is a commodious Roman Catholic chapel. It has also schools, a dispensary, and savings bank. The

town stands in a fertile district, and a considerable trade in malt and corn is carried on. Ardee was incorporated about the time of Edward III., but is now governed by a board of commissioners, elected under the Towns Improvement (Ireland) Act, 1854. The name is a corruption of Atherdee ("town on the Dee"). The population in 1881 was 2622.

AR'DEN, the name of one of the most extensive of the ancient British forests, is said to have reached from the banks of the Avon to the Trent on the N., and to the Severn on the W.; and to have been bounded on the E. by an imaginary line from Burton-upon-Trent to High Cross, the point of intersection of Watling Street and the Fosse-way on the border of Warwickshire and Leicestershire. On the division of England into shires this great tract of forest was divided among different counties, and only that part which was included in Warwickshire retained the name of Arden. Though there is no longer a continuous forest in this district it is still the best wooded part of Warwickshire, affording plenty of timber of almost all kinds, especially oak. Several places preserve the name, as Illey-in-Arden, Hampton-in-Arden, &c.

ARDENNES, the name of a former great forest and hilly region which commences in the French province of Hainault (now included in the department of Nord), and extends across Picardy, Champagne, and Luxembourg, as far as the Moselle. In the time of Julius Cæsar, who calls it *Arduenna Sylva* ("Bell. Gall." v. 6), it extended to the Rhine. The region of the Ardennes is intersected by a great number of valleys and deep narrow gorges. The prevailing rocks are clay-slate, grauwacke, conglomerate, quartz, and sandstone. There are rich iron mines towards the western part of the region. The surface is in general barren, and in many places there are extensive marshes, locally called *fagnes*. The forest timber is chiefly oak and beech; alder, ash, birch, are more rare; pines and firs occur but seldom. The highest peak of the Ardennes is Mont St. Hubert, 2300 feet.

ARDENNES, a department of France which consists of the northern part of the former province of Champagne, is bounded N. by Belgium, E. by the department of Meuse, S. by that of Marne, and W. by that of Aisne. The department lies between 49° 13' and 50° 10' N. lat., and between 4° 5' and 5° 21' E. lon. Its length is 63 miles, and its breadth 60 miles. Its area is 2021 square miles. The population in 1882 was 333,675.

The department takes its name from the forest region described in the previous article, which crosses its northern part. Another chain of hills, extending from the Vosges Mountains, crosses it from S.E. to N.W. This ridge fills the space between the Aisne and the Meuse, and takes the name of Argonne as it approaches Mézières, below which it joins the table-land of Rocroy. Formerly this region was very difficult of access, and furnished a strong protection against invasion on the east. That portion of the department north of Funay which projects into Belgium is calcareous, and contains gray marble and some veins of lead and iron ore. To the south of this a district, which includes Funay and Rocroy, crosses the department from east to west, and consists chiefly of slate, in which flint, quartz, granite, and pudding-stone occur, but no metals. The south-western portion of the department belongs to the great chalk formation of Aisne and Marne. Between the chalk and the clay-slate districts extends the region of fossiliferous rocks, which is generally coincident with the range diverging from the Vosges Mountains. In this part good building stone, plaster of Paris, and abundant deposits of iron ore are found. South of the Aisne the surface consists of high treeless plains. The more northern parts are hilly and generally well wooded, but in places there are extensive barren heaths, whence peat is procured.

The forests of the department, which are extensive, are a source of considerable wealth. The most common trees are oak, beech, elm, maple, ash, and birch. There are extensive downs which yield excellent pasture, especially in the chalk district. The best arable land is in the valleys of the centre of the department, and in that of the Aisne, which is one of the best corn-growing districts in France, and also produces cider and beer, but little wine. The climate is cold and moist. Great numbers of horses are bred. Sheep though small are numerous, and noted for the sweetness of their flesh and the fineness of their wool. There are numerous iron and copper mines, and slate quarries; and coal, porcelain clay, and sand used in the manufacture of plate-glass are found. The principal manufactures are ironmongery of all kinds, broad cloth, Cashmere shawls and other woollen stuffs, shoe and white leather, hosiery, coarse linen, and hats. There are also several glass-works, iron-furnaces, and brass-foundries. The navigation of the Meuse contributes greatly to the activity of the trade of the department, which consists of its mineral and manufactured products, together with corn, sheep, and wool.

The chief rivers are the Meuse and the Aisne, which are united by the Ardennes Canal, 25 miles in length. Ardennes is divided into five arrondissements—Mézières, Rocroy, Rethel, Vonziers, and Sedan, the first of which contains the town of Mézières, the capital of the department. Ardennes is comprised within the diocese of Rheims. It contains numerous schools and several colleges. The people are active, industrious, and well educated, and from them have sprung several men of renown.

ARD FERT, a small village of Ireland, in county Kerry, distant about 4 miles N.W. of Tralee, not far from Tralee Bay. It was formerly a place of importance and the see of a bishop, but is now included in the see of Limerick. A part of the ancient cathedral has been fitted up as the parish church. There are various ruins in the vicinity, among them being those of a Franciscan abbey founded in the thirteenth century. A round tower, 120 feet high, one of the finest in the country, which formerly stood here, fell down about a hundred years ago.

ARD GLASS, a small seaport town of Ireland, county Down, 6½ miles south of Downpatrick and 68 N.N.E. of Dublin, on the Belfast and County Down Railway. It was formerly represented in the Irish parliament, and became a place of great importance, so much so that a large trading company obtained a grant from Henry IV. and settled here. When in the height of its prosperity it was the chief port in Ulster. Its privileges were, however, afterwards bought up by the crown, and with the rise of Belfast and Newry commerce declined. The inhabitants are principally engaged in fishing, and there are some exports of grain. Ardglass has a pier, with a lighthouse at its extremity. The inner harbour will admit vessels of 100 tons at high-water, while the outer is available for ships of 500 tons at all states of the tide. Ardglass has a church, Roman Catholic chapel, and schools. Its name, which signifies "green height," is derived from its position between two hills, which form a landmark for sailors. The town has been much improved, and is much frequented in summer as a bathing-place. There are the remarkable ruins of five ancient castles in the town, one of which, held by Simon Jordan, successfully resisted a siege of three years by the Earl of Tyrone in the reign of Elizabeth.

ARDNAMURCHAN POINT, in the county of Argyll, Scotland, is the most westerly point of Great Britain. It is surmounted by a lighthouse 180 feet in height, visible at a distance of 18 miles. In the vicinity is the ruined Mingary Castle, nearly surrounded by water, once an extensive fortress, where James IV., in 1498, held his court to receive the submission of the chieftains. In

1644 it was captured by the royal forces; it was also besieged by the Marquis of Argyll, but relieved.

AB'DOCH, the name of a quoad-sacra parish in Perthshire, Scotland, 8 miles S.W. of Crieff, in which are the remains of a Roman station and three Roman camps, more perfect than any others in Great Britain. The station is supposed to have been founded by Agricola in one of his northern campaigns.

ARDROS'SAN (Gael. *ard-roisan*, "high foreland"), a seaport town of Scotland, in Ayrshire, 31 miles from Glasgow and 15 from Ayr. The streets are wide, and cross each other at right angles, and the houses are neat and well-built. The public buildings consist of a town-hall, several churches and banks. The place is frequented in the summer for the benefit of sea-bathing. It has a very extensive harbour, which is capable of accommodating a great number of vessels of large size, there being a depth of from 15 to 20 feet of water at full tide. It is protected by a small island known as Horse Isle, and by a breakwater on which is a lighthouse, and being thus rendered secure against all winds is sometimes crowded in boisterous weather with vessels which have run into it for safety. This work, to which Ardrossan owes its rise, was commenced in 1806; it is formed on a magnificent plan, and was constructed under the patronage, and chiefly at the expense, of Hugh, twelfth earl of Eglinton. He acted on the belief that Ardrossan would become the harbour of Glasgow, and thus render unnecessary the circuitous navigation of the Clyde. In order to unite the harbour with the city of Glasgow, a canal was projected, but was not completed further than from Glasgow to Johnstone in Renfrewshire. The construction of the harbour was suspended after Lord Eglinton's death, but in 1845 it was partially completed and connected with the Glasgow and South-western Railway. There are also graving and floating docks for the repair of vessels.

Ardrossan appears to have been a fishing village several centuries ago, and is found mentioned as early as 1226. Its castle, now in ruins, was captured by Wallace when held by the forces of Edward I. in 1297, and reduced to its present condition by Cromwell. By an Act of Parliament passed in 1846 the town was created a burgh, with a corporation consisting of eight officers.

Prior to 1863 Ardrossan was tributary to Irvine, but it subsequently became an independent port with bonding privileges. The number of vessels registered as belonging to it in 1862 was 120 (20,000 tons). The entries and clearances each average 3000 (330,000 tons) per annum. There is regular steam communication with Glasgow and the Clyde ports, and also with Liverpool and Belfast. Iron-founding and shipbuilding are carried on at Ardrossan. Much timber is imported, and there is a good trade in the export of coals and pig-iron. The population in 1861 was 4036.

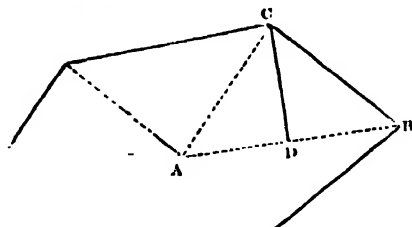
ARE, the modern French measure of surface, forming part of the new decimal system adopted in that country after the Revolution. It is obtained as follows:—The metre or measure of length, being the forty-millionth part of the whole meridian, as determined by the survey, is 3·2809167 English feet; and the are is a square, the side of which is 10 metres long, or about 107·6 English square feet. The decare contains ten ares, and is the next denomination; but the measure most generally used in describing a quantity of land is the hectare, of 100 ares, equal to 2·47 English acres, or 40½ hectares make 1000 acres.

AREA. This term is a Latin word, and means the same thing as *superficies* or *quantity of surface*, but is applied exclusively to plane figures. The word is also applied to signify any large open space.

The measuring unit of every area is the square described upon the measuring unit of length; thus we talk of the

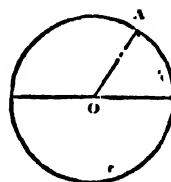
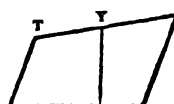
square inches, square feet, square yards, or square miles which an area contains.

Any figure which is entirely bounded by straight lines may be divided into triangles, as in the adjoining diagram. The area of every triangle may be measured separately by either of the following rules, in which the word in italics may mean inches, yards, miles, or any other unit, provided



only that it stands for the same throughout. 1. Measure a side, AB , of the triangle ABC , and the perpendicular CD , which is let fall upon it from the opposite vertex, both in *units*. Half the product of AB and CD is the number of square *units* in the triangle, ABC ; because a triangle is half the size of a rectangle of the same height and breadth. Thus, if AB be 30 yards, and CD 16 yards, the triangle contains 240 square yards. 2. Measure the three sides, AC , CB , BA , in *units*; take the half sum of the three, from it subtract each of the sides, multiply the four results together, and extract the square root of the product; this gives the number of square *units* in the triangle. For instance, let the three sides be 5, 6, and 7 inches; the half sum is 9; which, diminished by the three sides respectively, gives 4, 3, and 2; 9, 4, 3, 2, multiplied together, give 216, the square root of which is 14·7, 14·70 very nearly. The triangle, therefore, contains about 14½ square inches.

The following rules may be applied in the following cases:—For a parallelogram, multiply AB , a side, by CD , its perpendicular distance from the opposite side; for a rectangle, multiply together adjoining sides, PQ and PR ; for a four-sided figure, in which RT and SV are parallel,



but TV and NS converge, multiply NS , one of the converging sides, by YZ , its perpendicular distance from the middle point of the other. When RT and SV are perpendicular to NS , then YZ is half the sum of RT and SV .

To find approximately the area of a circle, multiply the radius, OA , by itself and the result by 355; then divide by 113, this being a close approximation to the ratio of the circumference to the diameter in all circles. Roughly speaking, the circumference of a circle is 3½ times the diameter of the same circle.

In all these cases the result is in the square units corresponding to the linear units in which the measurements were made. If the measurements were in inches the results are in square inches.

The area of a curvilinear figure can be truly found by mathematical processes, too difficult to be here described. This was formerly called the *QUADRATURE* of the curve (*quadratum*, a square), because, before the application of arithmetic to geometry, the most convenient method of representing an area was by giving the square to which it is equal. "Squaring the circle" is proverbial for an impossibility; as, like perpetual motion, although it can be approximated it can never be reached.

ARECA is a genus of *PALMS*. The stems are slender and very straight; they have no spines, but are marked with rings, the scars of the fallen leaves. The spadix which bears the flowers is branched, and inclosed by a double spathe. The fruits are in bunches with single seeds. The feather-shaped leaves crown the summit of the stem.

Arecu Catechu is described by Dr. Roxburgh as being the most beautiful palm in India, with a remarkably straight, high, smooth trunk. The Hindu poets speak of it as "an arrow shot from heaven." In circumference it hardly ever exceeds 20 inches. This palm is cultivated in the East Indies. It grows in groups, and seldom far from the seashore. It is cultivated all over India for the sake of its nuts, which, under the name of pinang or betel nut, are so universally chewed in the East Indies. It has a disagreeable astringent flavour, and is not eatable alone; but rolled up with a little lime in the leaf of the betel pepper it becomes milder and pleasant.

Areca oleracea, or the cabbage palm, is found in great abundance in the mountainous parts of Jamaica and other West India islands, growing to the height of from 100 to 200 feet, with a trunk not more than 6 or 7 inches in diameter. The leaves at the top, which form what is called the cabbage, are considered a great delicacy, either raw or boiled. The nuts, which are about the size of a filbert and covered with a yellowish skin, are white and sweet; they yield oil by decoction. The trunk when felled and exposed to the air quickly rots in the centre and becomes a natural hollow cylinder, which, on account of the hardness of its outside, forms a very durable water-pipe, often as much as 100 feet long, and becomes when buried almost as hard as iron.

ARENBERG, a small town of Prussia in the circle of Adenau and government of Coblenz, lies at the confluence of the Hase and Ems, about 10 miles N. of Lingen; it has a grammar school, soap and succory manufactories, two churches, an hospital, bleaching grounds, and some external trade. Its castle, now in ruins, was formerly the residence of the dukes of Arenberg. The ancient earldom of Arenberg was in 1547 raised to a principality, and to a dukedom in 1644; but after various additions to the territory the larger portion of it was lost by the peace of Luneville in 1801, to replace which Recklinghausen and Meppen were bestowed. These domains were incorporated in the French empire in 1810, and being afterwards made over to Prussia were partly relinquished by that power in favour of the King of Hanover in 1815. In 1826 the Hanoverian possessions were raised to a dukedom by George IV. of England, with the title of Arenberg Meppen. The whole of the estates extended over a tract of territory comprising an area of nearly 800 square miles, three-fourths being in Hanover, added to which there was considerable property in France and the Pyrenees.

ARENA, the name given in ancient times to the open space in the centre of an amphitheatre, where the combats of gladiators and wild beasts took place. It was usually strewn with sand (*arena*) to prevent the combatants from slipping, &c., whence the name. It had four main entrances, and was surrounded by a wall, the "podium," about 15 feet high, for the protection of the spectators. The top of the podium was extended into a broad flat

surface, supported by an arch, and upon this, as giving the best view, were the seats of the imperial party, the senators, the vestal virgins, ambassadors, &c. Behind them rose the immense tiers of seats (*gradus*) of the amphitheatre proper. The podium, besides being so high, was often further protected against wild beasts by a metal railing. In later times the name was given to any building used for displays of horsemanship, feats of strength and agility, &c. The name is also used figuratively to describe any place of contest or exertion.

ARENACEOUS ROCKS (Lat. *arena*, sand), in geology, are rocks composed for the most part of grains of sand. The grains are rounded, evidently by the action of water, and on this account these rocks are included in the class of *AQUEOUS ROCKS*. Sand is silex in a more or less pure condition, and thus is the same in mineral composition as quartz or flint. The grains are cemented together by siliceous or limy matter, or by oxide of iron or clay; often forming an exceedingly hard rock, as for example the sandstone of the Shunklin cliffs. At other times there is no cementing material, and the grains of sand are loose; this occurs in many of the beds of the Tunbridge Wells sand. Other materials besides sand occur in many of these rocks. A *micaceous sandstone* is one in which there is a quantity of mica. *Calcareous sandstones* are so named from a mixture of lime which can always be detected by an effervescence on the application of a drop of hydrochloric or other acid. When clay exists in any quantity the rocks are called *argillaceous sandstones*. Pure sandstones may be seen passing by insensible degrees into pure clay rocks. When the grains of sand are large the rock is a *grit*, and when they are large enough to be called pebbles the name of *conglomerate* or *pudding-stone* is used with reference to the rock.

ARENARIA (Lat. *arena*, sand) of *Sandwort* is a genus of small plants, which gets both the botanical and common names from its growing on sandy soils. *Arenaria* belongs to the section *Alsineæ* of the pink family *CARYOPHYLLACEÆ*, and is known from other genera by the following characteristics:—The five sepals are distinct from one another, the margin of each of the five petals is uncut or only slightly notched, there are three styles, and the ripe fruit (a capsule) splits open by six valves. The species are very widely distributed, one being found by Drs. Hooker and Thomson on the Himalaya Mountains at an elevation of nearly 18,000 feet. *Arenaria ciliata* is a rare British species, only occurring on the mountains of Sligo; the very closely allied *Arenaria norvegica* is found in Orkney and Shetland. Common species in the British Isles are *Arenaria serpyllifolia* and *trimeris*.

ARENDAL, a seaport of Norway, distant 35 miles from Christiansand in a N.E. direction, is picturesquely situated on the Skager-rack. The town, which is chiefly built on piles, is intersected by canals, and has sometimes been called the Little Venice. It possesses an excellent harbour, and has considerable trade in timber, and also in iron from the mines in the neighbourhood. Shipbuilding is carried on, and there are some distilleries and tobacco factories. King Louis Philippe found a refuge here after the French Revolution. The population in 1882 was 5000.

ARENCA, or Gomuto Palm, is one of those that produce sago, and from which palm-wine is obtained. The only species, *Arenga saccharifera*, is a plant of an ugly appearance, having a trunk 20 or 30 feet high, covered almost entirely with coarse black fibres resembling horse-hair. This palm is found in all the islands of the Indian Archipelago, in moist and shady ravines through which rivulets find a course. It is much used for the sake of its sap, which flows in great abundance from the wounded branches of the inflorescence about the time when the fruit is forming. A bamboo bottle is tied to the

extremity of an amputated branch, and removed twice a day, morning and evening. A single tree will yield a large quantity of this fluid, which when first drawn from the tree is transparent, with the taste and colour of new wine. After a short time it becomes turbid and milky, and acquires a slight degree of acidity. When fit for drinking it is of a yellowish colour, with a powerful odour and a good deal of astringency. The taste is disagreeable to those not accustomed to it. It is exceedingly intoxicating, but if drunk in moderation is said to be stomachic and wholesome. The coarse fibres of the stem and leaf-stalks are manufactured into powerful cables, and the trunk contains a great quantity of a nutritious meal like sago.

ARENICOLA. See LUG-WORM.

ARENSBURG, a seaport town in the island of Oesel, at the entrance of the Gulf of Riga, and within the limits of the Russian government of Livonia. It has a shallow harbour and a castle, and exports corn, hides, tallow, and timber. It is a resort for sea-bathing and mud baths. Population. 3500.

AREOMETER. See HYDROMETER.

AREOPAGUS, properly **AREIO-PAGUS** (*Areios pagos*, the hill of Ares, the "Mars' Hill" of St. Paul), a rocky height at Athens, to the westward of the Acropolis, and separated from it by a narrow valley. It was accessible only by two flights of steps cut out of the rock. Here met the famous Upper Council, which was commonly called "the Areopagus" on this account. (The Senate, or Council of Five Hundred, met in a lower part of Athens, called the *Cerameicus*.) It existed from remote antiquity, but Solon so completely reformed its constitution that, as Plutarch says, he received from most authors the title of its founder. The Council was composed of the archons of the year and of those who had borne the office of archon. The latter became members for life; but before their admission they were subjected to a rigid scrutiny into their conduct in office and their morals. Modern histories of this council do not commonly give the actual archons a seat in it. They are, however, placed there by Lysias the orator ("Areop." p. 110, 16-20). As a court of justice, the Areopagus had direct cognizance of the more serious crimes, such as murder. It exercised a certain control over the ordinary courts, and was the guardian generally of the laws and religion. It interfered on some occasions with the immediate administration of the government, and at all times controlled the conduct of the public functionaries. In the exercise of its duties, as public censor for the preservation of order and decency, it had very great powers.

The council, from its reorganization by Solon to the time of Pericles, seems to have remained untouched by any direct interference with its constitution.

Pericles was struggling to power by the favour of the people, and it was his policy to increase the business of the popular courts, whereby he conciliated his friends and strengthened their hands. The Areopagus, always of aristocratic tendencies, possessed originally some authority in matters of finance and the appropriation of the revenue. Pericles gave the popular assembly the full control of the revenue, and the administration of it was in the hands of the popular council, the Senate of Five Hundred. It seems that at first the Areopagites were invested with an irresponsible authority. Pericles obliged them, like other public functionaries, to render an account of their administration to the people (*Æschines*, "Contr. Ctes." p. 56, 30). After all, the Council retained a large portion of its former dignity and very extensive powers. Plutarch, who has told us more than others ("Cimon" c. 15; "Pericles" c. 7), says only that he removed from its cognizance the greater part of those causes which had previously come before it in its judicial character, and that, by transferring

the control over the ordinary courts of law immediately to the people, he subjected the state to an unmixed democracy. Among the causes withdrawn from its cognizance those of murder were not included. The change operated by Pericles seems to have consisted principally in this: from having exercised independent and permanent authority, it was made subordinate to the *ecclesia* (Aristotle, "Polit." ii. 9; "Diodorus" xi. 7).

The reform of Pericles, and his friend Ephialtes, took place B.C. 461, and was only effected against great opposition. Even the stage was used by their conservative opponents; the fine drama of *Æschylus*, the "Eumenides," was produced with the avowed object of rousing the Athenians to a sense of the sacredness of their ancient institutions.

In the time of Isocrates the moral influence of the Areopagus was still an effectual restraint on the conduct of its own members, though by this time its real power in the state had much decreased (Isocrates, "Areop." p. 147). Under the Romans, however, it retained some formal authority; and Cicero applied for and obtained a decree of the Council, requesting Cratippus the philosopher to sojourn at Athens and instruct youth.

The date of the extinction of the Areopagus is unknown, but it was in existence as late as the Emperor Theodosius (A.D. 380).

AREQUIPA, a department of Peru, extending along the coast of the Pacific from 15° to 17° 20' S. lat., and inland to the declivity of the Western Andes. It is divided into seven provinces, has an area of about 28,000 square miles, and a population of 200,000, the greater part of whom are Indians. Its chief products are gold, silver, lead, and other ores, nitrate of soda, sulphur, wheat, sugar, wine, and brandy.

AREQUIPA, the chief town, is one of the largest and finest cities of Peru. It is situated in a high and very fertile plain, about 35 miles from the coast, and contained in 1882 a population of 45,000. It stands on the banks of the river Chila, on the slope of the volcanic mountain of Arequipa, anciently called *Misti*, which rises in the form of a truncated cone to a height of 20,320 feet above the sea. The city was founded by Pizarro in 1539. It lies in a fertile valley, and is enriched by several gold and silver mines in its vicinity, and has a delightful climate. Its port is Islay, which has one of the best harbours in Peru, and with which there is railway communication. Arequipa is very liable to earthquakes, and experienced two specially severe shocks in 1687 and 1784. In 1868, however, it was visited by one more formidable than ever, by which it was almost entirely destroyed. The cathedral was left partly standing, but very few houses remained habitable; the loss of life, however, was small. The city has since been rebuilt, and is now united to Mollenda on the coast by a railroad 107 miles in length, nearly the whole of which is over a waterless desert. Other railway extensions have given Arequipa good communication with the interior. The line to Puno is one of the most remarkable in the world; it crosses the Andes, and reaches a height of 14,660 feet. Arequipa is the seat of a bishop, and besides its cathedral has a faculty of medicine, a university, college, public library, and hospitals. It is divided into five districts, each of which has its church and monastery.

ARES, in the Greek mythology, the god of battle—not, as is sometimes carelessly put, the god of war; for this implies thoughtfulness and preparation, and is represented rather by Athena. Ares stands more as the personification of the fierce headlong fight; and in older coins, &c., is figured as bearded, of mature years, and in full strength. The conception of him as a finely-proportioned companion for Aphrodite (as in the group at the Villa

Borghese, Rome) is of later times. The word Ares is evidently from the same stock as *Arya* (Sanskrit), *Vir* (Latin), the excellently strong, the manly.

Ares was one of the twelve principal gods of Greece, the son of Zeus and Hera, but few myths have him for their hero. His chief seat of worship was in Scythia and the warlike Thracæ (Herodotus). At Sparta he was much honoured, dogs being sacrificed to him; and even men, according to an ancient tradition. Ares representing merely battle, fighting for fighting's sake, the reason is at once clear why he is by no means, though a god, always victorious; and, further, why he not unfrequently changes sides. In the Iliad, Diomedes, a mortal, defeats him; and Athena, hurling a mighty rock, stretches him on the earth howling, his gigantic frame covering seven acres.

According to some poets Ares himself was the boar that slew ADONIS, his mortal rival in the affections of Aphrodite. His passion for the goddess has already been mentioned in the article bearing her name. He figures largely in the din of battle that pervades the Iliad, but otherwise is not a favourite subject of the Greek poets. He was by the Romans identified with their god Mars or Mars.

Of the few local traditions that gather round Ares, the most famous is that which gives its name to the *AREOPAGUS*, the "Hill of Ares," at Athens. Here, says fable, the gods assembled in council because Ares had slain a son of Poseidon; but he was pardoned on showing that it was in protection of his own daughter Alcippe, the child of the nymph Agraulos.

ARETEUS the Cappadocian, one of the most valuable medical writers of antiquity, lived in the age of Vespasian. Areteus regarded a knowledge of the structure and functions of the body as a necessary step towards the study of disease; his anatomical remarks, however, betray sufficiently the imperfect state of this science in his time. Yet he was a great observer, and gave a good account of the portal vein (circulation of the liver), though he made the usual error that *all* veins arose from the liver. He regarded the liver as the great blood-making organ, and the spleen as the purifying organ. He included the intestines as organs of digestion, and not only proved the nerves to be the organs of sensation and of motion, but perceived their interchange of sides, whereby an injury to the left side of the head produces a paralysis of the right side of the body, &c. When he speaks, however, of nerves "which pass from one bone to another," he probably has confused nerves with tendons.

The descriptions which Areteus has given of the diseases to which the human economy is subject are accurate delineations, evidently taken from nature, and distinguished by a peculiar liveliness, elegance, and conciseness of diction. His account of epilepsy, tetanus, acute and chronic headaches, and burning fever, are peculiarly happy specimens of his manner of writing.

His method of treatment of acute diseases was rather strict attention to diet and regimen than the use of medicines; but in chronic diseases he frequently used sordorifics, stimulants, narcotics, purgatives, and emetics. He practised bleeding, used cupping glasses and leeches, and probably introduced the use of cantharides for blistering purposes.

Of the writings of Areteus, which are in Ionic Greek, only four books on the causes and symptoms, and as many on the treatment, of acute and chronic diseases are extant, and these are not complete. Of his other numerous and important works no trace remains. Had they been handed down to our times they would have formed most important additions to medical literature.

The standard edition of Areteus is that of Wigan (Oxford, 1723, folio), with a good Latin translation and notes. The Sydenham Society published an edition, with English translation by Dr. Adams, in 1856.

ARETHUSA, a Nereid, nymph of the fountain bearing her name in the island of Ortygia, near the ancient Syracuse. This island is the site of the modern town. Arethusa was beloved by the river-god Alpheus, and when the goddess Artemis, to save her from his pursuit, changed her into the fountain mentioned above, Alpheus plunged after her into the sea, attempting to mingle his waves with the water of the fountain, though he had to cross from Peloponnesus to Sicily. A cup thrown into the Alpheus in Greece would reappear (so the myth averred as a fact) in the fountain of Arethusa in Sicily. The physical basis for this favourite story lies in the undoubted subterranean descent of the river, which flows underground for more than 2 miles.

ARETINO, PIETRO, was born at Arezzo, in 1492. He left his native place very young, and went to Perugia, where he found employment as a bookbinder. After some years he set out from Perugia on foot, and went to Rome in quest of better fortune. He met with wealthy and powerful patrons, but disgraced himself by writing licentious sonnets. The court of Rome being informed of this scandal ordered the arrest of Aretino, who, however, escaped, and found a friend in Giovanni de' Medici, the famous captain of the Florentine republic, and by him was presented to Francis I. of France. After the death of Giovanni de' Medici he went to live at Venice, where he depended on his writings for subsistence, augmented by a pension from Francis I.'s great rival, the Emperor Charles V. He wrote both prose and verse, satirical *capitoli in terza rima*, heroic cantos, sonnets, and comedies, all in a coarse licentious style. He was called "the scourge of princes," and it is alleged that many nobles paid him considerable sums to purchase immunity from his satire, false or true.

Aretino still cast a longing eye towards Rome, with its many dignities and emoluments. For this purpose he dared to write several compositions on sacred subjects, such as Lives of Christ, the Virgin Mary, St. Catherine, and Thomas Aquinas, "A Commentary on the Book of Genesis," and "A Paraphrase of the Seven Penitential Psalms." The Duke of Urbino applied in his favour to Pope Paul III., and even proposed that Aretino, the very type of licentiousness, should be made a cardinal. Luckily for the credit of the Roman hierarchy the pope would not listen to such a suggestion. After Paul's death, Julius III., who was a native of Arezzo, was addressed by Aretino in a letter of congratulation, accompanied by a sonnet characterized by the most fulsome praise of the new pontiff. Julius made the poet a present and kindly received him at Rome, but gave him no encouragement to remain. He therefore returned to Venice, where he remained till his death in 1557. His "*Capitoli*" are the best specimens of his poetry; they are partly satirical and partly laudatory of several conspicuous characters of his age—Charles V., Catherine of Medici, Pope Julius, and the Duke of Urbino. Aretino is one of those instances of successful shamelessness which occasionally appear to astonish the world. His name is unknown, Pietro Aretino merely meaning Peter of Arezzo.

ARETINO, SPINELLO, one of the most distinguished of the early Italian painters, was born at Arezzo, in 1316. He was the pupil of Jacopo del Casentino, whom, however, he surpassed even as a boy. He obtained a reputation very early by some frescoes illustrating the life of San Nicolo which he executed in a new church of that saint at Arezzo. He afterwards painted the principal chapel of Santa Maria Maggiore at Florence, with subjects from the life of the Virgin and of Sant' Antonio Abate. He executed some frescoes in the monastery of San Miniato, near Florence, which still remain; others in the monastery of San Bernardo, at Arezzo; and others in distemper, in the monastery of Monte Oliveto, near Florence. He executed also six of the series of frescoes, illustrating the life of San Ranieri, in the Campo Santo at Pisa, which Vasari reckons among his best

works, preferring him to Giotto. The principal works of Spinello are not mentioned by Vasari; they are in the town-hall of Siena, and are from the life of Pope Alexander III. Aretino was still painting them in 1408, which probably was the year of his death. As in the preceding article, Spinello Aretino simply means Spinello of Arezzo.

AREZZO, a province in the kingdom of Italy, having an area of 1277 square miles, and a population of 238,707 in 1882. The soil is one of the most fertile in Tuscany, and produces silk, wine, corn, and olive oil. There are also excellent pasturages; and a large trade is carried on in cattle. The province possesses marble quarries, ironstone, and mineral waters.

AREZZO, the capital, is 34 miles S.E. of Florence, and is a main station on the railway to Rome. It is the ancient *Arretium*, which was one of the wealthiest and most populous among the twelve cities of Etruria. It was repeatedly at war with Rome, but afterwards became its ally, and supplied money and arms towards Scipio's expedition to Africa near the end of the second Punic War. The government was then similar to that of Rome, having its senate, its patricians, and plebeians. *Arretium*, having joined the Marsi and other Italian nations in the Social War against Rome, was devastated by Sulla, the inhabitants were dispersed, and a Roman colony was sent into the country. The pottery of *Arretium* was in great repute. After the fall of Rome, *Arretium* was ravaged by the Goths under Totila, but was restored under Justinian. It then passed under the dominion of the Longobards, and afterwards of Charlemagne and his successors. The bishops of Arezzo were made feudal counts, and ruled in the name of the Emperor and King of Italy. In the eleventh century, however, Arezzo, like most Italian cities, threw off its allegiance to the empire, and adopted a republican form of government. It was subsequently distracted by the factions of the Guelphs and Ghibelines. In 1384 the city was taken and plundered by Ingelram de Coucy, a famous Condottiere of the times, who sold it to the Florentines for 40,000 gold florins. After more than a century Arezzo revolted against Florence in 1502, was again taken, and treated with great severity. In 1529 it opened its gates to the army of Charles V., which was then besieging Florence, but was obliged, in 1531, to submit to the Medici, when it was merged into the duchy of Tuscany. The town was stormed by the French in 1800.

Arezzo is 3 miles from the left bank of the Arno. It stands on two hills in the middle of a fine plain, watered by the Arno and the Chiana, and is surrounded by an amphitheatre of mountains. The Citadel is on the summit of one of the hills. The only remains of antiquity are the ruins of an amphitheatre. The cathedral is a large Gothic building, which contains a fine altar by Pisano. There are several other remarkable churches with fine paintings, and various handsome palaces belonging to the nobility, as well as a university, museum, medical school, library, and several hospitals. But the finest structure in Arezzo is that called *Le Loggie*, by the side of the town-house on the principal square, which has a portico nearly 400 feet long. The celebrated wine called *Altenano*, the finest in Tuscany, is made here. Arezzo is a bishop's see. The town has been the birthplace of some of the greatest men of Italy, among whom may be mentioned *Marcus, Petrarch, and Guido*, the monk-musician. Michael Angelo was born at Caprese, a few miles distant. The population in 1882 was 38,950. An important musical festival attended by distinguished musicians from every country, was held here in 1882. A fine statue of Guido, by Salvini, was unveiled.

AR'GALI (*Ovis argali*), the name of a species of wild sheep found in the elevated steppes of Siberia and the mountain chains of Central Asia. The largest measure over 4 feet at the shoulder, and the horns are so large that

it is said that the fox takes refuge in them as they lie bleaching on the mountains of Thibet. There is a mane round the neck, white in the male, brown in the female. The horns diverge as much as 36 inches at the tips. There are many allied species in Central Asia, and one in North America, to all of which the term *argali* is applied as a common name. The big-horn or American *argali* (*Ovis montana*), a native of the Rocky Mountains, is considered by many naturalists to be the same species. In it the horns grow so far forward and downward that old males can only feed on a descent. See **SIBIR**.

AR'GAND, AIMÉ, a natural philosopher, physician, and chemist, celebrated as the inventor of the lamp bearing his name, was born at Geneva about the year 1755. He produced his first lamp while resident in London in the year 1782. It was the outcome of numerous experiments made by the inventor to overcome the two great difficulties that had previously prevented a bright and steady light being obtained by an oil lamp, viz. the sinking of the oil in the reservoir during use, and that arising from its incomplete combustion, which caused smoke and smell. The first difficulty he surmounted by raising the oil above the level of the flame and by providing for a constant and steady supply to the wick; and the second, a far more difficult and important matter, by placing the wicks in the form of a circle and causing a current of air to ascend around and through the flame by means of a chimney of glass. The introduction of the chimney was claimed by a Parisian named Lange, and Argand decided to admit his claim rather than to incur the risk and expense of a lawsuit. The patent was accordingly taken out in their joint names, and they obtained a monopoly for fifteen years. This, however, was stoutly resisted by the whole trade, and the outbreak of the Revolution, by sweeping away all such privileges, destroyed all hope of profit from the invention. Argand returned to England, and afterwards retired to Geneva. Here he studied alchemy for a time, but becoming involved in poverty, he sunk into a deep and settled melancholy, and died in great misery, 24th October, 1803.

ARGAND LAMP. See **ARGAND, AIMÉ**.

AR'GAS. See **ACARDEA**.

AR'GAUM, a village in the Akola district, Behar, on the route between Ellichpur and Aurangabad, being 135 miles N.E. of the latter place. Its name signifies "City of the Wells," of which it possesses no less than 800. It is only remarkable as the site of a decisive victory, on 28th November, 1803, over the Mahrattas by the British under Sir Arthur Wellesley, who afterwards became Duke of Wellington. A medal commemorative of this event was struck in 1851, and presented to the survivors.

AR'GELANDER, FRIEDRICH WILHELM AUGUST, one of the most distinguished astronomers of modern times, was born at Memel, 22nd March, 1799. He studied at the University of Königsberg, where in 1820 he was appointed assistant to Bessel, whom he aided in calculations and in taking observations. In 1823 he was appointed superintendent of the observatory of Åbo in Finland, as successor to Walbeck, and in 1832 he was transferred to the University of Helsinki. Here he remained until 1837, when he was appointed professor of astronomy at the University of Bonn, a post which he retained until his death, which took place on 17th February, 1875. His memoirs are very numerous and of great value. In 1822 he published an essay on the path of the comet of 1811, and while at Helsinki a catalogue of 560 of the fixed stars having "proper motion." In 1837 he published an important paper on the proper motion of the solar system, and after removing to Bonn he completed his "*Neue Uranographie*" (1843), and his "*Astronomical Observations of the Northern Heavens*" (1846, et seq.), in which he gives

the positions of 22,000 stars. He subsequently published the Bonn series of catalogues of the fixed stars, in which 820,000 are enumerated.

During the later period of his life he was principally engaged in observations of the changes of light in the variable stars, and his latest observations, made during the year preceding his death, were directed to the bright comet of 1874.

ARGENS, MARQUIS D', JEAN BAPTISTE BOYER, a prolific writer of the last century, but whose celebrity at present chiefly depends on his intimate connection with Frederick the Great of Prussia, whose attention had been attracted by his "*Lettres Juives*," the best known, perhaps, of any of his numerous works. D'Argens was born at Aix, in Provence, on the 24th of June, 1704, and after leading a versatile and far from irreproachable life, he settled at Berlin as the king's friend in 1741, but at length returned to France in 1769, and died there in 1771. "Was the king's friend for thirty years," says Carlyle ("*Frederick the Great*," xvi. 9), "helped several meritorious people to his Majesty's notice, and never did any man a mischief in that quarter. An erect, guileless figure; very tall, with vivid countenance, chaotically vivid mind; full of bright sallies, irregular ingenuities." His principal works are, "*Mémoires de Monsieur le Marquis d'Argens, avec quelques Lettres sur divers Sujets*," "*Lettres Juives*" (1754), 8 vols. 12mo; "*Mémoires Secrets de la République des Lettres*" (1744), 7 vols. 12mo; these *Mémoires* contain notices of the lives, acts, and peculiarities of numerous writers that can only be found elsewhere by consulting a great variety of authors; the "*Lettres Juives*," and "*Lettres Chinoises*," contain similar notices; "*Réflexions Critiques sur les différentes Ecoles de Peinture*" (1750), 12mo; "*Lettres Chinoises*" (1755), six vols. 12mo.

ARGENSOLA, LUPERCIO LEONARDO DE, brother of the almost equally well-known Bartolomé, was born in 1565 at Barbastro in Aragon, Spain, and began his studies at the University of Huesca. He afterwards went to Saragossa, where he studied Greek, history, and rhetoric. Before he had attained his twenty-fifth year he went to Madrid, where his patroness, the Princess Maria of Austria, had fixed her residence, and he was made her secretary, his brother Bartolomé becoming her chaplain. The Count of Lemos, having been appointed viceroy of Naples, took Argensola with him, and made him his secretary of state, and also secretary for war. In 1613 he died at Naples. He left behind him three tragedies, some poems, and other works. Bartolomé wrote the *Annals of Aragon* by Zurita, a *History of the Conquest of the Molucca Islands*, some letters, satires, and other poetical effusions. As poets both the brothers are, if not in point of originality, at least for their correctness and purity, among the first that Spain has produced. Their poetry is vigorous, abounds in wit and classic dignity of style, and above all, is marked by correctness of taste, on which account they have been styled the Horaces of Spain.

AR'GENSON, MARC PIERRE, COMTE D', a distinguished French statesman, was born in 1696. He came of an illustrious family of Touraine, and after several minor appointments became secretary of state to the minister of war in 1742. The following year, on the death of Cardinal Fleury, the whole burden of the office fell upon him, at a time of national humiliation and disaster. His vigorous efforts and fortunate choice of generals soon changed the state of affairs, and the victories of Fontenoy and Lawfeldt, the capture of Bergen-op-Zoom, and the siege of Maestricht enabled him to secure peace by the famous treaty of Aix-la-Chapelle in 1748. After the war he devoted his attention towards the fortifications of France, and in 1751 established the *Ecole Militaire*. He was a friend of Voltaire, whom he supplied with materials for his

"*Siccle de Louis XIV.*" The famous *Encyclopédie* of Diderot and D'Alembert was dedicated to him by the editors, out of gratitude for his liberal patronage of literature. During the later period of his life he suffered from neglect and exile, owing to the intrigues of Madame Pompadour, but after her death he returned to Paris, where he died in 1764.

AR'GENT, a French word meaning silver. In heraldry it is used to signify that metal, and is left white in shield-engraving.

AR'GENTAN, a town of France, in the department of Orre, situated on a hill above the river Orne, 22 miles N. of Alençon, with which it is connected by railway. It is a clean, well-built place, surrounded by old ramparts, which form a pleasant walk and afford a fine view of the valley of the Orne, and has civil and commercial tribunals, a college, and 5700 inhabitants. There are linen and cloth factories, bleachworks, and tanyards, besides some trade in corn, hides, cattle, poultry, and cheese; gloves and embroidered articles are also made. The lace called *Point d'Argentan* used formerly to be manufactured in this town. The old castle and the churches of St. German and St. Martin are the most remarkable buildings. Henry II. received at Argentan the Papal legates who came to mediate on behalf of Becket.

AR'GENTEUIL, a market town of France, in the department of Seine-et-Oise, 12 miles S.E. of Versailles, is prettily situated on a hill above the right bank of the Seine, which is here crossed by a toll bridge. The neighbourhood is famous for the best ties grown north of Paris. Argenteuil is on the Cherbourg line of railway, and has a population of 4600. It was the site of the convent in which Heloise took the vows. The old fortifications were levelled in 1810, and an agreeable walk has been formed on the spot. There is an ancient parish church and an hospital, and in the vicinity are some gypsum quarries.

ARGEN'TEUS CODEX, or "*Silver Book*," the name given to a manuscript, or rather fragment of a manuscript, containing the greater part of the four Gospels in the Mæso-Gothic language, preserved in the library at Upsala, in Sweden. It is believed to be a relic of the Gothic Bible, all or the greater part of which was translated by Uphilas, bishop of those Goths who were settled in Mæsia and Thrace, and who lived under the Emperor Valens about A.D. 360. This curious fragment was discovered in the library of the Abbey of Werden in Westphalia. The leaves are of vellum, some purple, but the greater part of a violet colour; all the letters are of silver, except the initials, which are of gold. These letters, which are all capitals, appear to have been stamped or imprinted on the vellum with hot metal types, in the same manner as bookbinders at present letter the backs of books. This copy is judged to be nearly as ancient as the time of Uphilas, or at least not later than a century or two after.

The Gothic Gospels of the "*Silver Book*" were first printed in types approaching to a fac-simile by Junius, in 1671; again in common type at Stockholm, in 1671; by Mr. Iye at Oxford, in 4to, 1750, with a Gothic Grammar prefixed; and lastly by Zahn, 4to, Weissenfels, 1805.

AR'GENTIERE, L., the chief town of the arrondissement of the same name, in the department of Ardèche, is situated on the Ligne, 21 miles S.W. of Privas. It has a tribunal of first instance, and there are some silk factories, tanneries, and rope-walks; the lead mines of the neighbourhood, which formerly also produced a considerable quantity of silver, are now abandoned. The environs of this town present a great number of natural curiosities, the result of volcanic action. Population, 3000.

AR'GENTINE is a fish of the salmon family in the order *Physostomi*. It has been found off Norway, on the west coast of Scotland, and off the Yorkshire coast. It is abundant in the Mediterranean. One species (*Argentina*

decagon) has also been found in New Zealand. There are no teeth in the jaws, but a few, rather small, are found on the roof of the mouth and the tongue. The dorsal fin is short and in advance of the ventrals. The scales are large, those on the back firmly adhering to the body. The length varies, several species attaining to as much as 18 inches.

The *Argentina sphyrena* is figured in the Plate of **PHYSOLOGY**. This fish is silvery white, approaching a light olive tint on the back; there is a small black spot on the snout.

ARGENTINE REPUBLIC or CONFEDERATION, THE, is, after Brazil, the largest state of South America. It is bounded on the N. by Bolivia; on the W. by Chili; on the E. by the Atlantic, Brazil, Paraguay, and Uruguay; and on the S. by Patagonia. It lies between 22° and 41° S. lat., and 54° and 71° W. lon. The population was estimated in 1882 at 2,400,000. The number of inhabitants has increased of late years in consequence of immigration from Italy, Spain, and France. The district of Gran Chaco, or "Great Desert," with a population of about 100,000 free Indians, is claimed by the Confederation, as well as the Southern Desert to the Rio Negro, and Patagonia as far as the Straits of Magellan.

Surface and Soil.—About one-sixth of the surface of this country is mountainous; the remainder consists of wide plains, on which are scattered a few isolated ranges of hills, and an extensive system of low mountains, called the Sierra de Cordova. The most mountainous districts lie on and along the eastern declivity of the Andes, where there are many lofty summits far above the snow-line, and several volcanos. The northern part of this hilly region is outside the Argentine Republic, and is included in Bolivia. The rivers which have their origin among these mountains furnish the greater part of the supply for the Rio de la Plata. The valleys are numerous, and many of them are very fertile.

The *Despeñado* (i.e. "uninhabited country") is a plain on the top of the Andes, at an elevation of 13,000 feet, and therefore too high for vegetation to grow; but gold, chinchilla, and vicuña skins are obtained from it. The rest of the country consists of immense plains extending from the coast to the base of the Andes, and covered over nearly their whole surface by low brushwood, with here and there a clump of trees; and the pampas, or grass-covered prairies, stretching from the south of the river Salado down to the almost unknown deserts of Patagonia. The most northern part of the plains, which is known under the name of El Gran Chaco, extends on the east of the mountain region as far as the banks of the Rio Paraguay, and to the confluence of the Rio Salado with the Parana, occupying all the tract between these rivers. This immense country covers 120,000 square miles. The southern portion, between 26° and 30° S. lat., is a complete desert for want of rain and water. That part of the plains which lies between 30° and 33° S. lat. has a different character. Nearly in the middle of it is the Sierra de Cordova, a system of heights which in another place would be called mountains, but in the neighbourhood of the snow-clad Andes can only be called hills. The valleys between them exhibit many fertile spots. North-west of this range are the Las Salinas, or salt plains, which extend for about 200 miles in length by 60 miles in breadth, and are always sterile. There are in this region many salt lakes, into which numerous rivers flow without having any outlet to the ocean.

The *Pampas* comprehend that part of the country which extends from 33° S. lat. to the southern boundary of the republic, and though generally considered as one plain, extending on a perfect level from the shores of the Atlantic to the base of the Andes, nature has divided it by some tracts of more elevated ground into several regions,

which differ in soil and fertility. The N. and N.W. contains some forests, but in other parts there is great scarcity of wood. The Rio Salado of Buenos Ayres, the southern stream of that name, divides the Eastern Pampas into two nearly equal parts. Though numerous settlements have been made in the country north of this river, by far the greatest part is still in its natural state. It is a continuous level plain, covered with coarse luxuriant grass, growing in tufts and partially mixed with wild oats and trefoil. The grass is dried up during the hot summer months. In parts there grow immense numbers of thistles 10 or 12 feet high, which form, while they last, an impenetrable barrier, but when withered serve for fuel. All the rivers are impregnated with salt; but good well-water is procured at a short depth beneath the surface. The country south of the Rio Salado is of a somewhat different character. Near the banks of the river it is on a level with the country north of it, which it resembles in every respect; but at a distance of about 10 miles from the stream swamps begin, which extend over most of this region. The greatest part of the Western Pampas—viz. all the country west of 62° W. lon., and extending thence to the Andes between 34° S. lat. and the Rio Negro—is almost unknown.

The Argentine Republic contains also an extensive tract of hilly country, which lies between the rivers Parana and Uruguay. In the northern part of this region is the Lake Laguna de Ybera, which, from N. to S., is in some places nearly 100 miles long, and from E. to W. about 80 miles broad. It covers an area of more than 3000 square miles. A narrow strip of elevated ground divides its northern border from the Rio Parana, and it is supposed that it is supplied with water from that river by infiltration, as no stream enters it. That portion of this country which extends from the Lake of Ybera in a north-eastern direction to the boundary line of Brazil, is known under the name of the *Misiones*, from the circumstance of the Jesuits having collected there a great number of aborigines, and accustomed them to a civilized life.

Rivers, &c.—All the rivers which drain the Argentine Republic north of 34° S. lat. carry their waters to the wide estuary called La Plata. [See PLATA, RIO DE LA.] Before they reach this fresh-water sea they form two large rivers, the Parana and the Uruguay. The Parana originates less than 50 miles from the shores of the Atlantic, on the table-land of Brazil; and, after leaving that empire, flows 900 miles through the Argentine Republic—its total course being at least 1800 miles. It is navigable for vessels of 300 tons up to the point where it incloses the large island of Apipé, 120 miles above its junction with the Paraguay. Falls prevent navigation beyond this spot. After its confluence with the Paraguay, the width of the river varies from 1½ mile to 2 miles, but the whole volume of water seldom flows in one channel, as the current is divided by a continuous series of islands overgrown with low trees and subject to inundations. It opens into the La Plata with a large number of embouchures, forming a long but comparatively narrow delta, composed of a great number of islands.

The Paraguay, the largest of the affluents of the Parana, likewise originates in Brazil, through which country it runs for about 1000 miles, mostly in a S. direction, and, entering the Argentine territory, continues its course for about 400 miles, till it joins the Parana. It is navigable nearly throughout the whole of its length—1420 miles—and is open to ships of every flag. The Paraguay receives an immense amount of water from the Andes by numerous tributary rivers, of which the Pilcomayo and the Vermejo flow about 750 and 900 miles respectively. The largest affluent of the Parana, next to the Paraguay, is the Salado, which rises on the southern border of the table-land of the

Despoblado, and runs through the plains a distance of nearly 1000 miles before it joins the Parana.

Of the rivers falling into the Atlantic south of the La Plata, the chief are the Rio Salado ("Salt River"), of Buenos Ayres, the second stream in the republic bearing that name; the Rio Dolos or Dulce ("Fresh River"), which runs parallel to the Salado, but, emptying itself into a lake, does not reach the sea; the Rio Colorado; and the Rio Negro.

As already stated, lakes—most of them salt—are numerous; and artesian wells are now largely made use of in the countries at the base of the Andes.

Climate, Productions, &c.—The great differences of level within the territories of the Argentine Republic produce a very different climate in the various regions of which it is composed. The difference of heat and cold felt on the table-land of the Despoblado and the countries surrounding the Gran Salina is the greatest that occurs on the American continent, though these districts are less than 800 miles from each other. Extreme heat, however, is the characteristic of a great part of the country. In the Western Pampas the air is extremely dry, and there is no dew at night; rain also is very scarce. The Eastern Pampas are very wet: rain occurs all the year round, and a heavy dew falls every night. In these parts sudden changes of the atmosphere are frequent; sometimes they raise or depress the thermometer 20 or even 30 degrees in a few hours. The abundance of moisture in the air and the sudden changes from heat to cold are due to the winds, the worst of which is the *pampero* (from the *pampas*), which resembles a hurricane; sometimes it is accompanied by terrific thunder and lightning, and brings so much sand with it as to darken the air at Buenos Ayres in mid-day. Along the coast the mean annual temperature is 60° or 70° Fahr.; in the interior the thermometer varies from 32° to 100°, according to the season, locality, and the wind (whether from N. or S.), and on the Andes the heat or cold depends upon the elevation. In districts not affected by the *pampero*, the climate, over a vast area of the country, is both healthy and extremely agreeable.

Of late years remarkable progress has been made in all branches of agriculture. Maize and millet are grown all over the country, wheat in the Plata basin, barley on the coast and in the valleys of the Andes, and rice in Paraguay and Tucuman. The sugar-cane is cultivated in the west, but the quantity of crystallized sugar made is very small in proportion. Other products are cochineal, tobacco, indigo, madder, and cinchona bark. The fruit trees cultivated are mostly those of southern Europe; which, once imported, have become indigenous, and abound in the valleys of La Plata and its tributaries. They comprise the vine, orange, peach, olive, fig, apricot, apple, and pear. Wines and brandy are made only in the valley of the Andes and the provinces of Mendoza, San Juan, Catamarca, and Salta; and they are almost entirely used for home consumption. Cocoa and coffee are grown, but only in small quantities. Among the few forest trees are the pine, elm, oak, plane, maple, ash, and poplar. Yerba maté or Paraguay tea is largely cultivated on the Parana and Uruguay rivers, and exported to other parts of South America. In some places it grows wild.

There are immense herds of cattle, sheep, and horses, and numbers of mules. Indeed, the principal exchangeable wealth of the country is derived from these sources—the largest items in the list of exports being hides, horns, wool, hair, tallow, and jerked beef. The wild cattle were formerly so abundant that they were sometimes killed for the sake of the hides alone when very thin. Formerly the cattle were mostly unappropriated, like the land they roamed over; but a large extent of the pampas has of late

years been carefully surveyed by the government, and allotted to individuals. Every animal a year old is branded with the mark of the owner, and that mark, being registered, entitles him to recover his property wherever found. In the province of Buenos Ayres alone it is estimated there are nearly 7,000,000 cattle. The breeds of sheep were once of inferior quality, but have been much improved. Most of the wild animals of South America are met with in this country: the guanaco, llama, and vicuña abound in the vicinity of the Andes; and the other indigenous species comprise the puma, jaguar, armadillo, and biscocha, and the small quadrupeds which furnish the nutria and chinchilla skins. The seal and whale fishing on the coast are not unimportant. The mountains of the Andes in themselves contain almost all the known metals; gold and silver are also procured from the Sierra de Cordova, which, with the other systems, are rich in various other minerals. Formerly very few mines of any sort were worked, but the mining interests of the country are every year assuming a greater importance, especially in the districts of San Juan, Cordova, and Catamarca.

Inhabitants.—The population of the Argentine Republic consists chiefly of descendants of Spaniards, who are occupied in the management of the large cattle and sheep estates, many of whose owners are very wealthy. The poorer classes assist in the management, and are called *gauchos*, among whom there is a large mixture of negro blood. They are a hardy, powerful race, constantly on horseback, and exceedingly expert with the lasso and the bolas. The lasso is a strong, platted leather thong 20 or 30 feet long, at one end of which is a running noose. This noose the gaucho, at full speed, throws round the neck, horns, or legs of the animal he is pursuing, then draws it tight and throws the animal down, the horse of the rider assisting by the position in which he puts himself. The bolas are three balls connected with leather thongs about 8 feet long—one of the balls is held in the hand while the others are whirled round the head of the hunter, and then, at full speed, the whole is flung at the animal to be captured. It twists round its legs and throws it down, and the gaucho then comes up and secures it.

Of late years the government have done much to foster foreign immigration, and thousands of persons have been attracted from all parts of Europe—chiefly from Italy, Spain, France, and Great Britain. The chief obstacles to the success of British immigrants consist in the climate, the language, habits, and religion of the natives, the insecurity of life and property, by reason of the lawlessness of the native population, the incursions of the Indians, and the defective administration of justice. For many years a chronic state of revolution existed in the country, which of itself was sufficient to prevent any efficient domestic government, and many of the difficulties mentioned are almost inseparable from a thin population scattered over a vast territory. Recent reports, however, state that the government is taking effectual steps to render the country not only tolerable but inviting to emigrants. Fresh arrivals from Europe are not only cordially welcomed, but every effort is made by the authorities to induce foreigners to settle in the country, retaining, at their own option, their foreign nationality, or becoming Argentines.

The southern Indians have their pasture grounds south of the Rio Negro de Potuzones of Buenos Ayres. They are divided into innumerable petty families, each governed by its own cacique or *ulmene*, who occasionally claims by hereditary title, but has little authority, except in time of war. They quarrel and fight with one another, and only unite in predatory excursions against the whites.

Area.—The following table contains a list of the fourteen provinces actually composing the Argentine Confederation, with their estimated area:—

Provinces.	Area. Eng. sq. miles.
Littoral—	
Buenos Ayres,	63,000
Santa Fé,	18,000
Entre Ríos,	45,000
Corrientes,	54,000
Andes—	
Rioja,	31,500
Catamarca,	31,500
San Juan,	29,700
Mendoza,	54,000
Central—	
Cordoba,	54,000
San Luis,	18,000
Santiago del Estero,	31,500
Tucuman,	13,500
Northern—	
Salta,	45,000
Jujuy,	27,000
Total,	515,700

To these figures have to be added the area of the various territories, as follows:—

Gran Chaco,	125,612
Misiones,	23,932
Pampas,	191,842
Patagonia,	317,400
Total,	688,796

By a treaty concluded between the Argentine Republic and Chili in 1881, the latter recognized the right of the former to all the country east of the crest of the eastern ridge of the Andes, including most of Patagonia and a small part of Tierra del Fuego.

Trade and Commerce.—The manufactures of the Argentine Republic scarcely deserve mention; and in general manufactured goods are imported from abroad in return for raw produce. The people, in fact, depend upon others to a remarkable extent; for, with the exception of bread, meat, and vegetables, there is hardly an article of daily consumption which is not introduced from abroad, although it may confidently be affirmed that, with a proper development of the resources of the country—favoured as it undoubtedly is, both as regards fertility of soil and unrivalled climate—almost all kinds of bread-stuffs, groceries, &c., might be produced in quantities sufficient to satisfy all home requirements, and leave a very considerable surplus for exportation.

The chief wealth of the state at present lies in its countless herds of cattle and horses and flocks of sheep, which are pastured on the pampas, and which multiply there very rapidly. The rearing and tending of these herds is the great and characteristic industry of the country; and these also yield the enormous quantities of hides, horns, tallow, and salted beef which form the staple export of the Republic. The principal imports are manufactured goods, coal, and iron. The internal commerce is considerable, being greatly facilitated by a network of railways which is rapidly covering the country; for whereas in 1864 there were not more than 50 miles open, in 1882 there were more than 1500 miles in working order, and 1000 miles more had been sanctioned by the government (at whose expense nearly all the lines are constructed), including an international route from Buenos Ayres to Chili, 894 miles in length. At present the railways are a heavy drain on the national resources, but they are of great value in the development of the country.

The La Plata and its numerous tributaries afford ready water ways; and travelling is not difficult in any part. There is a submarine cable to Europe, and telegraphic communication exists between all the chief towns, there being in 1882 about 14,000 miles in operation.

Under the domination of the Spaniards the commerce with

foreign countries was very small; but since the Confederation acquired its independence it has most considerably increased, and trade is now carried on with all the principal countries of Europe, and with various ports of America, to the extent of from £18,000,000 to £20,000,000 annually, about equally divided between imports and exports. The trade with the United Kingdom in recent years was as follows:—

	Exports to the United Kingdom.	Imports from the United Kingdom.
1882,	£1,231,200	£1,166,254
1883,	941,532	4,904,982
1884,	1,156,787	5,806,186

The most important articles exported to Great Britain from the Argentine Republic are tallow, sheep skins, hides, and bones. The imports from Great Britain consist chiefly of cotton, woollen, and iron manufactures.

Government, &c.—The present constitution of the Argentine Republic bears date 15th May, 1853. By its provisions the executive power is left to a president elected for six years by the representatives of the fourteen provinces, 133 in number; while the legislative authority is exercised by a Senate and a House of Deputies, the former numbering thirty, and the latter fifty-four members. A vice-president, elected in the same manner and at the same time as the president, assists in the discharge of the executive. The constitution is in many respects framed on the model of that of the United States.

The total expenditure of the central government of the Confederation is about £5,000,000 per annum; but for some years past the revenue has fallen short of this amount, so that the financial condition of the country is not satisfactory. The receipts are derived almost entirely from customs duties, which are very heavy. Each of the fourteen provinces or states of the Confederation has a revenue of its own, which is derived from the imposition of local taxes. The foreign debt amounts to about £25,000,000, in addition to floating liabilities estimated in 1885 at not less than £20,000,000. The army and navy consist of about 10,000 men; and the vessels of war include two ironclads and six gunboats. The vast majority of the inhabitants are Roman Catholics, but the fullest religious and social liberty is enjoyed by all. Education is liberally encouraged, and has made great progress. In 1862 only 22,000 children attended the public schools, but this number had increased to 95,000 in 1885. Between the same years the national colleges increased from two to fifteen.

History.—The wide estuary of the Rio de la Plata was discovered by Juan Diaz de Solis, who was sent to these parts in 1512; but Sebastian Cabot was the first to make a settlement in the country, in 1526. Various districts were visited and towns built during the same century; and all the countries thus conquered were joined to the viceroyalty of Peru, of which they formed a portion until 1775, when Buenos Ayres was divided from it, and constituted a separate viceroyalty. In the seventeenth century the Jesuits entered the country for the purpose of civilizing the Indians and converting them to Christianity. Their progress was at first slow, but after the year 1692, when they obtained more extensive privileges, they made great progress in their work, especially in Paraguay, the chief seat of their labours.

In 1806, Spain being allied with imperial France in the war against Great Britain, the British forces, under General Whitelocke, occupied Buenos Ayres and Montevideo. The expedition was grossly mismanaged, and proved unsuccessful: our troops were compelled to retreat; but the fabric of Spanish power was already in such a tottering condition that the blow, though slight, proved sufficient to consummate its downfall. The various provinces revolted against their Spanish governors, and after a struggle of some years,

duration, the provinces formally declared their independence in 1816. The Confederation was at war with Brazil for the possession of Uruguay from 1826 to 1828, and the contest was only terminated by the recognition of Uruguay as a distinct and independent power.

From 1865 to 1870 the Argentine Republic was allied with Brazil in a war against Paraguay, and after its close was disturbed by civil strife, which resulted in 1874 in the overthrow of the government, with the usual result of the accession of the victorious party to power. Buenos Ayres, which is a wealthy state, desired to separate from the thirteen other states, which are comparatively poor; and this resulted in almost chronic strife. Buenos Ayres city was besieged by the national party in 1880, and compelled for the time to remain in the Confederation.

("Statesman's Year Book" (1885); "Consular Reports" (1885).)

ARGENTON-SUR-CREUSE, a town of France, in the department of Indre, 16 miles S. by W. from Chateauroux, is built on both banks of the Creuse, and consists of an upper town, which grew up round an ancient castle now in ruins, and of a lower town, joined to the former by a stone bridge. Linen, cloth, tiles, bricks, woollen yarn, paper, leather, &c., are manufactured. The population in 1882 was 5200. In the neighbourhood of Argenton Roman medals and other relics have been found.

ARGES, a genus of fishes which, together with the allied Stygegenes, Astrolebus, and Brontes, have excited a good deal of curiosity from the confirmation which Humboldt gave to the assertion of the South American Indians that these fish (*preñadillas*, as they call them) are thrown out in streams of muddy water from the craters of active volcanoes. Sometimes after eruptions near Quito the stench of their putrefaction is so great as to give rise to putrid fevers. It is now ascertained that they exist in the lakes and streams of the Andes; they are killed by the escape of sulphuretted gases, and are then swept down by the torrents of water thrown out during an eruption. These fish belong to the family Siluridæ (CAT-FISHES). Their head is covered with soft skin; the mouth has a barbel on each side, no teeth on the palate, and the lower lip is broad and pendent; the eyes are small and covered with a transparent skin; the gill-opening is reduced to a short slit; the rayed dorsal fin, the adipose, pectoral, ventral, and anal fins, which are present, are short; the pectorals and ventrals are horizontal; the ventrals are six-rayed, and placed below the dorsal. (Günther.)

ARGILLAŒOUS (CLAY) ROCKS form that division of AQUEOUS ROCKS which contain a large proportion of alumina (or argil). See ALUMINA, CLAY.

ARGO, the ship in which Jason and the ARGONAUTS sailed to Colchis after the golden fleece. It was built by Argus, son of Phrixus, whence its name, and had fifty oars. After the expedition it was placed amongst the stars; and is figured in our Plate CONSTELLATIONS, S. Hemisphere, under the name *Argo Navis* (the Ship Argo). It will be found between numbers VII. and X., midway to the Pole; from its southerly position it is never fully seen in Great Britain. We see this constellation, low down on the horizon, in February and March. Canopus is its most brilliant star, but never rises above our horizon.

ARGOL, or Tartar, is an acidulous concrete salt which is deposited by wine, and forms a hard crystalline crust on the sides of vessels in which that liquid is kept, varying in thickness with the kind of grape used in making the wine, its ripeness, and the process of vintage. Argol is insoluble in strong alcohol, hence the crust of wine increases as it gains in strength. This crust in time becomes hard, brilliant, and brittle. It is easily reduced to powder, and is red or white according to the colour of the wine. Its chief constituent is acid tartrate of potassium

($C_6H_5KO_4$). When purified by solution and recrystallization it is called *cream of tartar*, and is much used medicinally. Besides acid tartrate of potassium, argol contains tartrate of calcium and traces of organic impurities. Tartar is used for the manufacture of tartaric acid. Cream of tartar is the mordant most frequently used in dyeing wool. Mixed with chalk and alum it constitutes the "plate powder" sold for cleaning silver. The argol brought from Germany, and produced from white wine, is the best. It is used by dyers as a mordant, and to neutralize various acid agents; a tartrate of tin is also prepared from it.

Argol is imported from all wine-producing countries, but chiefly from Italy and the south of France. The exports from that country are valued at between 3,000,000 and 4,000,000 francs per annum.

ARGOLIS, one of the ancient divisions in the north-eastern part of the Peloponnesus. It was bounded on the S. and N.E. respectively by the Argolic and Saronic gulfs. On the W. it was separated from Arcadia by a range of mountains; the territory of Corinth bounded it on the N. Argolis lay between $37^{\circ} 12'$ and $37^{\circ} 46'$ N. lat., and extended from $22^{\circ} 32'$ to $23^{\circ} 33'$ E. lon. Its greatest length, measured in a straight line along its western frontier from Laconia to Corinthia, was nearly 38 miles. Mr. Clinton ("Fasti Hell." i. 385) calculated its area to have been 1059 English square miles. Besides the city of Argos, which was the capital, there were the independent states of Epidaurus, Træzen, and Hermione. Argolis was traversed by a ridge of mountain which ran nearly in a line continued through the peninsula from Cyllene on its western frontier eastward to Cape Scyllæum, now Skyllo. The plain of Argos and Mycenæ was the most extensive open tract in Argolis.

Argolis, with Corinth, is now a department of the kingdom of Greece, forming only a small portion of the ancient territory of Argolis. The coast is irregularly shaped, with numerous indentations, and is generally low. The only good harbour is Nauplia, now Napoli di Romania, the capital of the department, at the head of the Gulf of Nauplia. The soil is fertile, though marshy in parts, and cotton is extensively produced. In ancient times the plain of Argos was famous for its noble breed of horses. The population of the combined region in 1880 was 136,081.

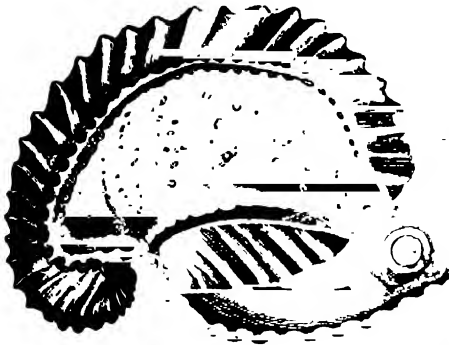
ARGONAUT (*Argonauta argo*) or Paper Nautilus must not be confounded with the Pearly NAUTILUS; the former belongs to the two-gilled section of the CEPHALOPODA, while the nautilus proper has four gills and a chambered shell. The nearest ally of the argonaut is the dreaded octopus or devil-fish, both having eight arms furnished with suckers. Two arms in the female argonaut have broad expansions at the ends, and these, Aristotle and others have declared, are spread as sails to the breeze, while the remaining six act as oars. The description which Montgomery gives in the "Pelican Island" is very beautiful—

"Light as a flake of foam upon the wind,
Keel upward, from the deep emerged a shell.
Shaped like the moon ere half her horn is filled:
Fraught with young life, it righted as it rose,
And moved at will along the yielding water.
• The active pilot of this little bark
Put out a tier of oars on either side,
Spread to the wafting breeze a twofold sail,
And mounted up and glided down the billow
In happy freedom, pleased to feel the air,
And wander in the luxury of light."

"Tis pity 'tis not true; but matter-of-fact naturalists declare that the use of the two webbed arms is to form the shell, and that, so far from being used as sails, they are stretched over the shell; while its motion, due neither to sail nor oar, is ignominiously in a backward direction below the surface, and effected, as in other cuttle-fish, by spouting water from

its funnel, unless when it varies its mode of progression by walking along the bottom by its arms, with the shell on its back and its head down. They do, however, sometimes drift in the shell along the surface of the ocean, and have been

taken in the stomach of a dolphin nearly 2000 miles from land. The shell is formed by the female for the protection of her eggs. The male is very much smaller (only an inch long), and has no shell; one of the arms, specially modified to



Swimming Argonaut.

move by itself, is detached to join the female, and was formerly described as a distinct animal, parasitic upon the argonaut.

ARGONAUTS, the sailors in the *Argo*—a company of heroes, some fifty in number, who sailed with Jason in the ship which his friend Argus had built, to fetch the golden fleece from Colchis.

Caster and Pollux, Meleager, Heracles, Orpheus, Theseus, Pelus (the father of *Achilles*), Admetus (the husband of *Alcestis*), Nestor (the sage king so famous in the siege of *Troy*), &c., were amongst them.

The golden fleece was in the possession of King *Æetes* of Colchis, and came to him from Phrixus the son of *Nephele*, who with his sister *Helle* had fled from a cruel stepmother on a golden ram given him by *Hermes*. Crossing over the sea from Greece, *Helle* fell off and was drowned in the channel called after her the *Hellespont*; but Phrixus arrived safely, traversed the shores of the Black Sea to Colchis, married the daughter of *Æetes*, and gave him in gratitude the fleece of the ram, which was then hung on an oak tree in the grove of *Ares*.

The first great halt of the heroes was at *Leinnos*, where the charms of the women delayed them long. Hence they coasted to *Cyzicus*, and a third halt was made on the coast of *Mysia*. *Heracles* had broken an oar, and he with the youth *Hylas* entered the forest to cut a new one. But the nymphs admired the beauty of *Hylas*, and carried him away as he was fetching water; and since *Heracles* would not leave the country without him, the Argonauts sailed on their way and left them. In the country of the *Bebryces*, where *Scutari* now is, the king *Amicus*, son of *Poseidon*, renowned as a boxer, issued his usual challenge. Either *Pollux* or *Amicus* was killed—the tale is told both ways; but all versions agree that the partisans of the vanquished hero made a terrific onslaught on those of the conqueror.

Victorious in this conflict, the Argonauts sailed away to *Thrace*, where two of the heroes, *Zetes* and *Calais*, sons of the north wind (*Boreas*), released the aged king *Phineus* from the *Harpies*, foul birds with the heads of women, who with long claws snatched away or defiled every meal as it was spread. In gratitude *Phineus* suggested a method of escaping the dangers of the entrance to the Black Sea. The channel ran between two rocks, the *Symplegades*, which revolved on their bases and crushed anything that attempted to pass between them. The stratagem was successful, for as the rocks opened again after having closed on the dove which, by the king's advice they had made to fly through, the *Argo* was swiftly rowed past; and she escaped with the loss of her rudder and some stern ornaments, just as

the dove had got free with the loss of its tail-feathers. The charm was broken, and ever since the *Symplegades* stand fast.

Eventually the Argonauts reached Colchis, and *Æetes* pretended to be willing to give up the golden fleece. He set as a reward, however, that Jason should first sow the rest of the dragon's teeth not used by *Cadmus* (received by *Æetes* from *Athena*), in a field ploughed with two fire-breathing horses with brazen feet. The same result followed the sowing as with *Cadmus*—armed men sprung up in the furrows and began to fight. But Jason came unharmed through all these dangers, through the witchcraft of *Medea*, daughter of *Æetes*, whom he had secretly promised to marry. His task accomplished, Jason was permitted to attempt the seizure of the golden fleece, guarded by a sleepless dragon. This would have been impossible but for *Medea's* magic powers, whereby the dragon was lulled to sleep. Returning to the Argonauts with his treasure, Jason found them in the greatest danger from the treacherous king, who had just matured his plans for their wholesale massacre, and for the burning of the *Argo*. The whole company fled, therefore, by night in the *Argo*, taking with them *Medea*. The king pursued them, and *Medea*, to gain time, cut to pieces her young brother *Abayrtus*, whom she had taken with her, and cast the limbs into the sea. This horrible scheme enabled the *Argo* to get safely away while the king was gathering the scattered remains of his son.

Zeus, angry at the crime, drove the ship on the *Absyrtian* islands in a storm; and *Argo* then found voice miraculously, declaring that it was necessary for them all to be purified by *Circe*, sister of *Æetes*, to appease the father of gods and men. The Argonauts accordingly sailed to the *Tyrrhene* Sea, where they found the island of the sorceress, and were purified of their sin.

They then set out homewards, and passed safely by the sirens, *Orpheus* drowning their magic song by music of his own. Only one hero heard the sirens and was fascinated; he sprang overboard to swim to them, but was saved from destruction by *Aphrodite*. The goddess *Thetis* carried them safely through the whirling rocks and between *Scylla* and *Charybdis*. The *Argo* was overtaken by a terrible storm in the *Ionian* Sea, but *Apollo* sent vivid flashes of lightning, by whose light the heroes escaped to the island *Anaphe*. Here they erected an altar to *Apollo*, and the rites they ordained were continuously observed down to the end of the classical period. Hence they gained *Crete*, then they halted at *Ægina*, and so passed by *Eubœa* to *Iolchus*, home.

Probably the whole myth arose from the trading voyages made by the enterprising Minyans who dwelt near Iolchus.

AR'GONNE, a forest and hilly district in France, on the frontier of the ancient provinces of Lorraine and Champagne, and extending into each of them. It is now included in the departments of MEUSE, MARNE, and ARDENNES. It is about 60 miles in length, but of very unequal breadth. St. Menchould was the capital of this country, and among the other towns which are situated in it are Clamont, Varennes, Beaumont, and Grandpré.

AR'GOS, the chief city of Argolis, is situated on a level plain at the foot of a hill called Larissa (on which was its citadel and a temple of Jupiter), and on the banks of the rivulet Inachus, now Banitza. It is considered to be the most ancient city of Greece. Its earliest inhabitants are thought to have been Pelasgi. In the mythic age it was governed by kings, of whom Inachus was the first. According to the Greek myth, Argos was the scene of the principal "labours" of Heracles; and it was in the neighbourhood that he killed the Nemean lion and destroyed the Lernean hydra. Agamemnon was the ruler of the kingdom of Argos during the siege of Troy. By Homer's time the town of Mycenæ had displaced Argos as the capital; but after the break up of the old kingly rule, and the formation of many separate small states, Argos gradually resumed supremacy over the neighbouring towns of Tiryns, Mycenæ, &c., though always jealously limited by Sparta.

Passing to the historic period we find that Argos had been so crushed by her tyrannical neighbour at a great defeat near Tiryns, just before the Persian invasion, that she was unable to take any part in the defence of Greece. Before this epoch the possessions of Argos had extended to Cape Malea, and included Cythera and other islands. In B.C. 468 the Argives were again strong enough to be at war with the inhabitants of MYCENÆ, who were overthrown and their city reduced to ruins, from which it never again rose (Diodorus, xi. 65).

Though Argos remained neutral during the earlier part of the Peloponnesian War, she at last took an active part against her ancient tyrants, the Spartans. The defeat of Mantinea, B.C. 418, dissolved the confederacy of which Argos was the head, and compelled her to accept an aristocratic constitution (Thucydides, v. 65-81). She subsequently shook off the Spartan yoke and joined the Achaean League, of which confederacy she formed a part till its final dissolution; when, like the rest of Greece under the Roman conquest, she became merged in the Roman province of ACHÆIA. The great deity of Argos itself was Hera (Juno); but there was a fine Doric temple between Argos and Corinth, dedicated to Zeus Nemæus, in the inclosure of which the great NEMÆAN GAMES, one of the four national festivals of the ancient Greeks, were celebrated each alternate year. A nobly modelled column of this temple, the ruins of which are still imposing, is engraved in our Plates on GREEK ARCHITECTURE. Close to Argos also lay Mycenæ and Tiryns, the first about 6 miles to the N.E., and the second a little to the S.E. All three have what are called *Cyclopean* (perhaps Pelagic) architectural remains of the greatest interest. These consist of large stones, accurately fitted together without cement, and are of unknown antiquity. They comprise portions of the walls of Argos, the "Lion Gate" and "Treasury" at Mycenæ (of which there is an engraving in the Plate ARCHITECTURE), and the famous "arched" gallery at Tiryns. See ARCHITECTURE.

In early times music and poetry were cultivated in Argos, but by the time of the splendour of Athens under Pericles these arts seem to have been quite neglected in the older city. But in sculpture Argos has the honour of claiming as her son Ageladas, the master of PHIDIAS, MYRON, and POLYCLETUS. Not only was this Ageladas Argive

by birth, but also Polyclethus his pupil. And if Phidias, the Athenian, was unequalled in the majesty with which he endued his sculpture of the gods, Polyclethus, the Argive, was acknowledged to be unsurpassed in the representation of man—even to the extent of his statue, the "Spear-bearer," gaining the title of *Canon*, that is, the perfect rule or model. The noble statue erroneously restored as an athlete, in the Vatican collection at Rome, is pronounced by the best authorities to be a copy of this *Doryphorus* or spear-bearer of Polyclethus; and in the same collection there are a few other fine works believed to be copies from the statues of the great sculptor of Argos.

Argos is still known by its ancient name. It passed into the possession of the Turks in the fifteenth century, and suffered much during the struggle for Greek independence in 1825. It is the market town of the province. In the height of its prosperity Argos is said to have contained 100,000 inhabitants. The present population is 10,000. Part of the plain around is cultivated, and cotton, vines, and rice are grown.

AR'GOSIE, a ship of great burden, whether for merchandise or war. In Rycart's "*Maxims of Turkish Policy*," chap. xiv., it is said, "Those vast carracks called *Argosies*, which are so famed for the vastness of their burden and bulk, were corruptly so denominated from *Ragosies*," i.e. ships of Ragusa, a city and territory on the Gulf of Venice, then tributary to the Porte. We have no proof, however, that the Ragusan vessels were particularly large; and it seems more likely that the *Argosie* derived its name from the classical ship *Argo*.

It seems almost certain that the word is simply the Spanish *Argos* (the ship *Argo*) with an added *y*. The *y* is no doubt for *i*, the usual Latin plural ending, for Marlowe ("Jew of Malta") uses "*Argosy*" as a plural. Why the Spaniards used *Argos* for *Argo* is quite unknown, but that does not alter the fact.

ARGOS'TOLI, the principal town of Cephalonia in the Ionian Islands, lies at the foot of a mountain on the west shore of the Bay of Cephalonia. It has a good harbour, fit for ships of the largest size, and about 9000 inhabitants. It has some ancient ruins, is the seat of a bishop, and carries on silk-spinning and shipbuilding. There are some mills driven by a remarkable stream flowing inwards from the sea. Opposite Argostoli, across the bay, is the port of Lixuri, which possesses a considerable export trade, and is in a more wholesome situation than the capital.

AR'GUIN, one of a cluster of small islands in the Bay of Arguin, about 8 miles from the western coast of Africa, in 20° 24' N. lat., 16° 11' W. lon. It was taken possession of by the Portuguese, who erected a fort upon it in 1461 for the protection of commerce, then consisting of gold and negroes, but afterwards of gum-arabic and feathers, and it became successively an object of contention and bloodshed to the Portuguese, Dutch, French, and English. Arguin has been supposed to be the *Cerne* of Hanno. An extensive and dangerous shoal, called the Arguin Bank, stretches 30 leagues along the land in a S.S.E. direction, from off Cape Blanco to Cape Mirik. Turtle fishing is carried on by the French. There is a town of the same name on the adjoining coast.

AR'GUMENT, a reason offered for or against a proposition, and in logic the ground or premiss on which a conclusion is based. By common usage it is applied to any debate, discussion, or controversy. There are several kinds of argument which have been distinguished and named by logicians, among which may be named the *Argumentum ad hominem*, a method of reasoning somewhat largely used, but which consists merely in an appeal to the prejudices or previous admissions of the person addressed, and which offers no real proof at all. The

Argumentum a consensu gentium consists of an appeal to the general opinion of mankind, and the *Argumentum a tuto* to the real or supposed safety in receiving a certain conclusion. One of the most potent forms of argument is the *Reductio ad absurdum*, so largely employed by Euclid, the method of which is to show the falsity of a proposition by admitting its truth "for the sake of the argument," and then deducing rigorously from it the greatest absurdities.

A powerful method of reasoning is found in the *Argumentum a baculo* ("argument by the cudgel"), which, when adopted by despotic rulers, military commanders, secret societies, or excited mobs, is exceedingly difficult to answer. Another form of argument seldom noticed by logicians, and chiefly used in domestic controversy, is that known as "the ladies' reason," which consists of an affirmative or negative with the prefix "because." Though not always convincing it is generally unanswerable.

The term argument is also used to designate the subject of a discourse or treatise, and the divisions or summary of a book. In astronomical tables it is the angle on which the tabulated quantity depends, and with which, therefore, in technical language, the table must be *entered*. If, for example, a table of the sun's declination were formed, corresponding to every degree, &c., of longitude, so that, the longitude being known, the declination might be found opposite to it in the table, then the longitude would be made the *argument* of the declination.

ARGUS, the hunder of the Argos, was the son of Phrixus (who swam the Hellespont with his sister Helle on the golden ram) by Cleiopea, daughter of Eetes, king of Colchis. Medea was therefore Argus' aunt.

ARGUS, a giant with a hundred eyes, sometimes said to be the son of the preceding. He was set by the revengeful goddess Hera to watch Io, after her transformation by her lover Zeus into a white cow; and he was keeping guard over her, tethered to a tree in a grove sacred to Hera, near Argos, when Hermes, sent by Zeus to effect Io's escape, arrived to fulfil his task. Violent seizure was forbidden him, and Argus only closed fifty of his hundred eyes at a time, even in his deepest slumber. Hermes, therefore, first told him endless tales till he was thoroughly soothed, and then killed one eye after the other to sleep by his sweet playing on a shepherd's pipe. He then slew Argus and led away the cow, and for ever after his favourite title was Argophontes, the Argus-slayer.

Hera, after the death of Argus, took his eyes to adorn therewith the tail of her sacred bird, the peacock.

It is probable that the wandering Io, hunted from place to place by the persecution of Hera, typified the moon, and that the hundred eyes of Argus stood for the multitude of stars.

ARGUS PHEASANT is a very beautiful bird belonging to the pheasant family (Phasianidae), of the order GALLINÆ. They are about the size of an ordinary barn-door fowl, but the two central tail-feathers are enormously lengthened. The secondary quill-feathers of the wings are also very long (about 3 feet), and are covered with splendid eye-markings like a peacock's tail. The general hue is brown. Two species are known—the common argus from the Malay Peninsula, and Gray's argus from Borneo. Those in the Zoological Gardens have laid eggs which were hatched under a domestic fowl, but the young birds are very delicate and difficult to rear.

ARGYLE, or ARGYLL, a shire in the west of Scotland, comprehending an extensive district on the mainland, and several of the Hebrides or Western Isles. After Inverness, it is the next largest county in Scotland. It is bounded N. by Inverness-shire, and E. by Perth, Dumbarton, and Renfrew shires, from the last two of which it is separated by Loch Long and the Firth of Clyde. On other sides it is washed by the Atlantic Ocean; but the

islands of Bute and Arran, which form the shire of Bute, lie close to it to the S.E. The line of the coast is very irregular. Deep indentations of the sea penetrate far inland. The principal of these, beginning from the N., are Loch Moidart and Loch Shiel, which communicate by a narrow passage, and separate Argyleshire from Inverness-shire; Loch Sunart, which runs into the land in an eastern direction; and Linnhe Loch, which runs nearly N.E., having at its N. extremity Loch Eil, and Lochs Creran and Etive as inlets on its E. side. From Linnhe Loch the coast runs in a S.W. direction for about 80 or 90 miles (broken successively by the Lochs Fecchan, Melfort, Craignish, Crinan, Swin, Killisport, and West Tarbet), to the Mull of Cantire. From this headland the coast, after running eastward a short distance, returns N. by E. for about 35 miles to Skipnish Point, forming the long narrow peninsula of Cantire. From Skipnish an arm of the sea known as Loch Fyne penetrates inland for a considerable distance in a N. direction. Proceeding along the coast, we find Lochs Rìdon and Striven, also running northwards, and lastly, the Firth of Clyde, with its inlet Loch Long. The total extent of the coast line is estimated at more than 600 miles, and no part of the interior is more than 12 miles distant from the sea or from some sea loch.

The greatest length of the county is about 115 miles, and the greatest breadth, including islands, about 87. Exclusive of the islands the breadth is only 55, and in the 27 southernmost miles of the county it is nowhere more than 10 miles wide. The area is 3200 square miles, or rather more than 2,000,000 acres, of which one-sixteenth only is under cultivation.

The islands belonging to Argyleshire are the following:—Canna, Rum, Muck, Coll, Tiree or Tyree, Mull, Lismore, Lorn, Kerrera, Seil, Easdale, Luing, Shuna, Lunga, Seabla, Jura, Colonsay, Oronsay, Islay, Gigha, Sanda, Gometray, Ulva, Staffa, Iona, &c. Mull, Jura, and Islay are each nearly 30 miles in length; but all the others are very small.

The population of the county in 1881 was 76,468, which was an increase of 789 as compared with 1871. In 1831 the population was 100,973.

Argyle is mountainous, and presents an appearance more pleasing to the lover of the picturesque than to the agriculturist. The barrenness of the soil and the want of cultivation are shown by the scanty population, which amounts only to about twenty-four for every square mile of land in the shire.

The northern and eastern parts, where it borders on the Grampians, are the most rugged; along the coast the ground is in general lower and more level, yet particular mountains near the sea rise to a great height, and are indeed among the loftiest in the shire, as well as in Great Britain. The principal peaks are Bidean-na-nabhain, 3760 feet; Ben Cruchan, 3669; Buchan Etive, 3340; Ben Ima, 3318; Ben More, in the island of Mull, 3174; and Ben Arthur, or "The Cobbler," 2880.

The chief rivers in the county are—the Urray, which rises in the Grampians and flows into Loch Awe, and the Awe, which serves to connect Loch Awe with Loch Etive, and through it with the sea. The basin of these rivers is estimated at 250 square miles. Streams of smaller importance are numerous, as might be expected from the nature of the country, and good salmon and trout fishing is obtainable. There are no large inland lakes except Loch Awe just mentioned, but smaller ones are both numerous and picturesque.

Argyleshire is divided into six districts—Mull, Lorn, Argyle proper or Inveraray, Cowal, Cantire or Kintyre, and Isla or Islay. Knapdale is divided between the two latter.

The geological formations of Argyleshire comprise principally granite, mica-slate, flint-trap, columnar basalt

(especially at STAFFA), and a few coal beds. Lead and copper are found in Islay, coal in Mull and Campbeltown, and iron near East Tarbet, but the mineral yield is unimportant. The slate quarries of Easdale island have been among the most considerable in Lorn. Patches of lias and oolite occur in some of the islands. The granite quarried near Inveraray takes as fine a polish as marble; and the *lapis ollaris*, or potstone, a talcose rock, with which the Duke of Argyll's castle at that place is built, is one of the most handsome building stones found within the borders. Marble is found in the island of Tiree and elsewhere. Strontian, cobalt, and coral occur in or near the county.

Argyleshire has a very variable and moist climate, but from its situation on the coast, and from the numerous inlets of the sea by which it is so deeply indented, the temperature is mild. Frost seldom continues long on the sea coast, and snow rarely lies more than two or three days at a time. Mildew, blight, and hoar-frost seldom do much injury to the husbandman. The north-eastern parts, bordering on the Grampians, have a colder climate; though even there the valleys, sheltered by the surrounding heights, are neither so cold nor so uncomfortable as might be supposed.

The farmers of this county direct their attention chiefly to the breeding of stock and the feeding of sheep, for which the rough and mountainous character of the surface is better adapted than for tillage. There is, indeed, a considerable quantity of arable and improvable ground in the vales interspersed among the mountains, and along the margin of the streams which wind through them, but the chief proportion of arable land is on the coast. The soil varies materially: light loam near the rivers and sea; light gravelly soil on the sides of hills; clay soils, mosses, and marshes in the low ground; heath on many of the hills and flats; and barrens on the highest hills. About 46,000 acres are woodland.

According to the agricultural statistics published in 1885 only 120,000 acres—or less than a sixteenth of the whole area—are under cultivation. The chief crops were oats, 20,000 acres; potatoes, 7000 acres; turnips and swedes, 5000 acres; clover and artificial grasses, 21,000 acres; permanent pasture, 60,000 acres. The stock of cattle in the county was 60,000, and of sheep, 1,000,000.

Formerly the farms were exceedingly small, and this circumstance, combined with the want of capital, kept the tenants in a dependent and depressed state. This, however, is now very much changed, by means of extensive emigration, mostly to Canada, and the incorporation of the small holdings into larger farms. The farm buildings, too, have been very much improved. The inhabitants, even the poorest, have usually gardens attached to their houses, but their produce is not much varied. The general food of the people is oatmeal, of which a considerable quantity is imported, and potatoes.

The cattle of this district constitute one of the chief articles of export; they are of the west Highland breed, and are reared for the southern market. The sheep occupy, in many places, the high grounds, where they have been substituted with great advantage for black cattle; they are chiefly of the Linton or black-faced kind. Horses, swine, goats, and poultry are reared, but not to any great extent. Wild deer and game are found, and large sums are paid annually for the right of shooting.

The manufactures of this county are unimportant, but the herring, cod, and ling fisheries are carried on extensively, and employ many hands. Large quantities of whisky are made at Campbeltown, and coarse woollens are manufactured.

There is good steamboat communication; by means of it the most distant parts of the county are brought into com-

munication with one another, and with Glasgow and other towns on the Clyde, to which they can send their stock and produce with the certainty of finding a good market.

The two principal canals are the Crinan, from Loch Fyne to Loch Crinan, which saves a voyage of 120 miles, and the Caledonian, which connects Moray Frith with Loch Linne.

Argyleshire contains few towns; the chief are Campbeltown, Inveraray, and Oban.

The county returns one member to the House of Commons; and Inveraray, Oban, and Campbeltown unite with Ayr and Irvine (Ayrshire) to return another. No alteration was made by the Redistribution of Seats Act of 1885. Argyll gives name to a synod, which has jurisdiction over all the parishes of the county except one, and over the shire of Bute.

Argyleshire contains many antiquities, such as the ecclesiastical ruins of Iona and Oronsay; Druidical circles and cairns; and castles at Dunstaffnage, Ardtornish, Inveraray, Skipnish, and Kilelurn.

After undergoing a variety of political changes in the middle ages the territory of Argyll became subject to thanes, so powerful that they were in fact independent. The lordship of Argyll, with Mull and the islands north of it, were subject to the McDougals of Lorn; Islay, Cantire, and the southern islands to the McDonalds, known by the style of "Lords of the Isles," or "Earls of Ross." The nominal allegiance of these last to the kings of Scotland was unsteady; but their power was broken in the reign of James III., towards the latter part of the fifteenth century. The acquisition of Lorn by the Stuart family by marriage, and the erection of the earldom of Argyll in favour of the Campbells of Loch Awe, weakened their sway still farther, and produced the diminution and at last the annihilation of it. In 1614 the McDonalds rose in insurrection to oppose the grant of Cantire to the Earl of Argyll and his relations, but the power of the Campbells prevailed. In 1748 all heritable jurisdictions were abolished by Act of Parliament, and civilization subsequently made great advances. The principal proprietors are the Duke of Argyll and the Earl of Breadalbane. The Gaelic language is still very generally spoken.

A'RIA, a province of the ancient Persian empire. It formed part of Ariana, or Iran, and bordered in the N. upon the Tapuri, Margiana, and Bactriana, in the E. upon the Paropamisadæ, and in the S. and W. upon Drangiana, Karmania, and Parthia. Its situation corresponds to that of the modern Seistan and the southern part of Khorassan. Strabo (xi. c. 10) calls Aria and Margiana the best provinces of this part of the earth. They are, he says, watered by the rivers Arius and Margos. The former of these, called also Arius, Areios, or Arrianos, is described by Arrian (iv. c. 6) as a river not less than the Peneios of Thessalia, yet losing itself in the ground. This account answers to the present Heri-Rud. The Margos is supposed to be the modern Murgh-ab.

Herodotus enumerates the Arioî (Gr. *Areioi*) as constituting with the Parthi, the Chorasmiî, and the Sogdi, the sixteenth of the twenty satrapies into which Darius divided the Persian empire (Herod. iii. 93). The ancient name of the Medi was Arioî (Herod. vii. 62). Lassen ("Indische Bibliothek," vol. iii. p. 71) supposes the name of the Arioî to be etymologically identical with the word *Arya*, by which the followers of the Brahmanic religion are designated in Sanscrit.

Alexander the Great founded a town in Aria, which he named Alexandria Arion (Alexandria of the Arioî). The site of this town is doubtful, but it is by some geographers supposed to be the present town of Herat.

A'RIA, ARIOSO, in music, an air or melody. *Arioso* is used, especially by Mendelssohn, to express a short

movement scarcely complete enough in form and development to be called an air, and frequently verging on the old *aria parlante*.

Although the word is strictly synonymous with tune or melody, yet aria has come to be limited to the *concert aria*, of which Beethoven's "Ah perfido!" and Mendelssohn's "Infelice" are splendid examples, and to similar solo pieces, of importance and in strict form, in oratorios and opera. Thus the aria in its most extended shape trenches upon the *scena*. Frequently it opens with a recitative, followed by a dignified melodious movement (with a second part sometimes developed), and concludes with a brilliant finale, frequently in the bravura style.

Aria concertante, an aria accompanied by the orchestra, after the style of an instrumental concerto.

Aria parlante, an attempt by the members of the "Florentine Academy," founded in the enthusiasm of the Renaissance about the year 1580, to reconstruct the old Greek system of musical declamation. Bardi, Corsi, Strozzi, and Vincenzo Galilei (father of the great Galileo Galilei) took part. The latter had the good fortune to discover the only specimens of Greek melody which remain to us, and himself set a portion of Dante in which he gathered from perusal of the ancients to be the Greek style. Peri and Caccini followed with an entire opera, or rather drama, in this style, performed at Florence in 1600 on the occasion of the marriage of Henri Quatre with Marie de Medicis. Finally, Monteverde perfected the style in his once famous "Orfeo." The objects aimed at are precisely those of Wagner in our day (so far as melodic structure is concerned)—abandonment of all formal trammels, and yet avoidance of utter formlessness; so that the song is merely sung speech, but speech which, by being clothed with sound and rhythm entirely suitable to its meaning, gains an intenseness and perfectness of expression in no other way to be obtained. It is highly curious to find Wagner in 1842 following out the same so-called reform on the same lines as Galilei in 1582; and it is probable that successful as the great latter-day maestro has been, yet in music as in all art the truest style and the most lasting beauty will be gained by working within artistic limits and not by impatiently throwing off restraints. Thus the compositions in strict form of the classical *ALLIARI* are sung in St. Peter's at Rome to this day; whereas none, except a few specialists, now know a note of all the *aria parlante* produced by his reforming contemporaries.

ARIADNE, in the Greek mythology, was the daughter of Minos (king of Crete) and Pasiphae. Her mother had brought forth an extraordinary monster called the Minotaur, who grew to gigantic strength and stature, with trunk and limbs of human form, surmounted by a bull's head, whence his name *Mino-taurus*, "the bull of Minos." The Minotaur was confined in a vast labyrinth made by the famous Dædalus, and fed by victims brought from neighbouring subject states, amongst others Athens. Theseus volunteered to go with the fourteen fated victims when the time came round; and on landing in Crete he completely won the affection of Ariadne, who supplied him with a clue of thread which passed through all the intricacies of the labyrinth, otherwise impenetrable. Theseus succeeded in slaying the monster, and successfully escaped from the labyrinth by help of the clue. Joyful at the deliverance of Athens he set sail homeward, accompanied by Ariadne; but fearing to take home a foreign wife he deserted her somewhat basely on the island of Naxos. Her distress on discovering the departure of the vessel was a favourite theme of poets and painters, and some of the best frescoes of Pompeii are on this subject. The young god of wine, Dionysus (Bacchus), fortunately discovered her, married her, and placed the crown he gave her on her marriage amongst the stars. (It is Corona,

close to Boötes in the N. Hemisphere of our Plate CONSTELLATIONS, between xv. and xvi.) This incident has also inspired fine works of art, both in ancient and modern times; and a modern statue, by Dannecker, of Ariadne riding on the panther sacred to Dionysus, is one of the attractions of Frankfurt.

ARIA'NA is the name given by ancient authors, after the age of Alexander the Great, to the eastern portion of those countries which form the high land of Persia. According to Eratosthenes (Strabo, p. 723, Casaub.), Ariana was bounded on the N. by the Paropamisus Mountains and their western continuation as far as the Caspian Pylæ, on the S. by the Great Sea (the Indian Ocean), on the E. by the river Indus, and on the W. by the hills which separate Parthylene from Media, and Karmania from Paraitakene and Persia.

The countries properly belonging to Ariana are, according to Strabo, in the E. the Paropamisadæ, the Arachoti, and Gedroseni along the Indus, proceeding from N. to S.; the Drangæ towards the W. of the Arachoti and Gedroseni; the Arii towards the W. of the Paropamisadæ, but extending considerably to the W. and S., so as nearly to encompass the Drangæ; the Parthiæ W. of the Arii, towards the Caspian Pylæ; and Karmania to the S. of the Parthiæ.

The original form of the name Ariana in the Zend or ancient Persian language is *Airyane*. From this seems to be derived the modern Persian name Iran, by which Oriental writers designate the country between the Tigris, the Persian Gulf, the Oxus or Gihon, and the Indus.

ARIA'NO, an episcopal town in the province of Avellino, in Italy, 50 miles E.N.E. of Naples, and 39 S.W. of the town of Foggia, is situated on a very steep hill on the main road from Naples to Puglia, and in the highest point (2900 feet) of the pass leading over the Apennine ridge into the plains of the latter country. It is the capital of a district, has a fine cathedral, several churches, a diocesan school, a castle, and hospital. Ariano was founded by the Greeks, and formed an important military post. It was taken by the Duke of Guise in 1648. The town has suffered much from earthquakes. Near it is a sulphurous lake. Numerous caves which have been dug in the hill-side are remarkable as being the residences of the poorer classes. Earthenware is manufactured, and butter and wine are exported. Population, 15,000.

ARIANS. See **ARIUS**.

ARIAS MONTA'NUS, BENEDICTUS, was born in 1527, of noble but poor parents, near the Andalusian border, in a mountainous district; and hence his name Montano. His early studies were carried on at Seville, and subsequently at Alcalá de Henares. He specially devoted himself to the study of Scripture in the original languages, and he acquired a knowledge of Arabic, Syriac, and Chaldaic. In his travels through France, England, Italy, Germany, and the Netherlands, he acquired several modern tongues. On account of his great scholarship, the Bishop of Segovia, Martin Perez Ayala, took him to the Council of Trent, where he shared in some of the most important transactions. He was invited by Philip II. to superintend the splendid and expensive edition of the "Polyglot Bible," which, at the suggestion of the printer, Christopher Plantin, was to be executed at Antwerp. Arias went to Antwerp in 1568, and devoted four years to this undertaking, and he had the pleasure of presenting the finished work to Pope Gregory XIII. in 1572. Unfortunately most of the copies of the work were lost in their passage from the Netherlands to Spain. The king remunerated Arias' labours with a pension of two thousand ducats, besides some lucrative offices. Arias was an upright orthodox Roman Catholic, and a truly learned man. His "Antwerp Polyglot" received the approbation and praise of the pope, and that of the most eminent Roman Catholic

universities; yet he was accused of a leaning towards Judaism, and in fact of heresy in general, and he narrowly escaped persecution. He died at Seville in 1598.

Arias was the author of various works, most of which are on religious subjects. Amongst them, however, is a "History of Nature."

ARICA, a seaport in the department of Moquega, in Peru, which is connected by railway with the town of Tacna, about 40 miles distant, where many of its merchants reside. From its position it is the natural outlet for the northern provinces of Bolivia, and exports copper, silver, barilla, alpaca wool, and Peruvian bark. The imports are chiefly from Great Britain and France. The port has frequently suffered from earthquakes, and chiefly from this cause it only contains a small population (5000), notwithstanding its fine bay and excellent anchorage. A most destructive earthquake occurred in 1868, accompanied by an immense tidal wave 50 feet high, and a similar visitation took place in 1877. The town has been partly rebuilt, and although its trade is not so extensive as formerly, about 250 vessels enter and clear annually. Although in a tropical region, Arica enjoys a cool and healthy climate. Sir Francis Drake plundered the town in 1579.

AR'ICHAT, a seaport of the island of Cape Breton, situated near the Gut of Canso, the channel which divides the island from Nova Scotia. It has a harbour, near which is a lead mine, and an extensive fishery trade. Population, 17,500.

ARIÈGE, a department of France, which is formed out of the ancient county of Foix, of Couserans, which belonged to Gascoigne, and of a small part of Languedoc. It is bounded N. and W. by the department of Haute Garonne, E. by that of Aude, S.E. by that of Pyrénées Orientales, and S. by Andorra and the Pyrenees, which separate it from Spain. The department lies between 42° 33' and 43° 19' N. lat., and between 0° 50' and 2° 8' E. lon. Its length from E. to W. is 66 miles, and its breadth from N. to S. 49 miles. The area of the department is 1890 square miles. The population in 1882 was 240,601.

Two-thirds of the department, coinciding generally with the arrondissements of Foix and St. Girons, are covered with mountains, which rise gradually from N. to S., and reach their highest elevation in the chain of the Pyrenees; the remaining part, comprehending the arrondissement of Pamiers, is mostly level. The principal summits of the Pyrenees in this department, with their height above the level of the sea, are Fontargente, 9164; Serrère, 9592; Montcahn, 10,513; Pic d'Estats, 10,611; Montvalier, 9120; and Montouléon, 9424. A spur from the main chain of the Pyrenees projects into the centre of Ariège, and forms the mountain of Plat de la Serre. The different branches sent out from this divide the water supply into two basins, that of the Ariège on the E. and of the Salat on the W. Several of the valleys are almost completely shut in, and communicate with each other and with the rest of the department only by the cols or depressions in the mountains, which are here called *ports*. The temperature is in general mild, notwithstanding the elevation of the surface, but it is more equable in the north than in the south, where near the highest mountains the heat in summer is suffocating, and the cold in winter is intense. There are large ponds and unhealthy marshes in some places.

The soil in most of the valleys is a deep black loam; in the plains about Pamiers and Saverdun it is light and gravelly, and in some valleys it is sandy, consisting chiefly of the detritus of the granite rocks. The mountains are in many places rocky and bare. The south of the department consists of transition rocks mixed with some layers of granite and limestone; to the north of Foix first the Alpine limestone, then the tertiary rocks prevail. Marble, freestone, alabaster, plaster of Paris, slate, coal, peat,

amianthus, lead, copper, turquoise, jet, jasper, and alum are found. Iron is abundant, especially in the mines of La Rancie in the valley of the Vic-Dessous, the ores of which yield 60 per cent. of that metal, and contain also a portion of silver. There are two salt springs in the department, and several hot springs, the most frequented of which are those of Ax and Ussat.

The highlands contain much pasturage, and in many places are covered with forests. In these the trees most commonly met with are firs, pines; and the oak, the elm, beech, and linden also flourish. Of fruit trees the apple, peach, and sweet chestnut are extensively cultivated. The lowlands produce wheat, Indian corn, millet, buckwheat, hemp, and flax, the seed of which mixed with that of the turnip furnishes the oil for burning chiefly used in the department. In the south the potato is extensively cultivated to supply the deficiency of corn, which does not ripen on the mountains. The wine of the department is of inferior quality, and is all consumed by the inhabitants. Sheep of good breed, horned cattle, and mules are very numerous; game is abundant. Of wild animals bears, wild boars, wolves, foxes, badgers, roebucks, chamois, otters, polecats, hares, and rabbits are found. Eagles, hawks, owls, wild geese and ducks, partridges, &c., are numerous. Fish, especially trout, abound in the rivers. The marshes are infested with great numbers of reptiles, among which the viper is common.

The inhabitants of the department, besides the usual agricultural pursuits, are engaged in the manufacture of steel, coarse woollens, linen, soap, hats, combs, porcelain, and pottery. There are also many sawmills, paper mills, sawmills, glass works, and numerous establishments for smelting iron and copper ores. The principal article of export from the department is iron. Wool is largely imported from Spain, which receives in return woollen fabrics, linen, cattle, and wax. Other articles of commerce are resin, pitch, turpentine, cork, marble, medicinal herbs, &c.

The chief rivers are the Ariège and the Salat. The Ariège rises in the Pyrenees near Mont Louis, and falls into the Garonne 10 miles above Toulouse, having run a course of about 90 miles, of which the last 20 are navigable. Between Foix and Saverdun particles of gold are found in the sands of this river and its affluents; this circumstance has given origin to the name Ariège, which is a corruption of *Aurigera*. The Salat rises in the col of Salau, and falls into the Garonne, after a course of about 55 miles, a little below St. Martory. Most of the streams in the department flow with a rapid descent, and many of them are used for purposes of irrigation, and as moving power for machinery.

Ariège is divided into three arrondissements—Foix, Pamiers, St. Girons. The town of Foix is the capital. Pope Benedict XII., Gaston de Foix, and Pierre Bayle are some of the famous men whom the department has produced.

A'RIES ("the Ram"), one of the twelve constellations of the zodiac, or path traversed by the sun, moon, and planets in the sky. Aries follows Pisces ("the Fish") and precedes Taurus ("the Bull"), and is best seen towards the close of November and the beginning of October.

At the time these constellations were formed each received a distinctive sign. But the sign γ (Taurus) is found in the constellation Aries, instead of the proper sign τ , which is found in Pisces. (The horns of the bull and of the ram are excellently indicated by these antique hieroglyphics.) This will be seen on reference to our *PLATE CONSTELLATIONS*, N. Hemisphere, where Aries is represented above the number 11., and his sign τ to the right, close to the Fish and the number XXIV.

The explanation of this discrepancy is that when the signs were adopted the sun entered Aries exactly at the

vernal EQUINOX (25th March), and this is equivalent to saying that the sun's apparent path, the ecliptic, cuts the heavenly equator (or great imaginary circle traced by astronomers in the heavens at the distance of 90° from the pole star) on this date, and shining level upon the earth, if the expression may be allowed, produces equal day and night of twelve hours each, all over the earth. Hence the expression equinox ("equal night," equal, that is, to the day). Astronomers therefore adopted the "first point of Aries" as their starting point for astronomical measurements; thus, for instance, if we know how high up a star is in the heavens (its DECLINATION), and how far to the right or the left it is from the "first point of Aries" (its RIGHT ASCENSION), we know its exact position in the heavens. But it was soon observed that the vernal equinox—that is, the intersection of the ecliptic and the equator—occurred every year more to the right (or to the west); and this discrepancy has gone on increasing until now the "first point of Aries" has got away from Aries altogether, and is, as we have said, in Pisces. For since all measurements are taken from this imaginary point, all the other *signs* of the zodiac have had to shift as it has shifted; and since the *constellations* of the zodiac are of course unaltered, all the *signs* are now just a constellation in front of their old place.

The reason of this gradual shifting of the "first point of Aries"—that is, the cause of the changing point of intersection of the equator and the ecliptic—will be explained under the article PRECESSION OF THE EQUINOXES.

ARIL, in botany, is a fleshy coating growing up round the ovule or young seed. It is formed after the fertilization of the seed, and is only met with in a few plants. The most remarkable instance of the aril among species of common occurrence is in the spindle tree (*Euronymus Europæus*), in which it is the fleshy red covering of the seed that renders that plant so ornamental in the autumn and beginning of winter. Another familiar case is the *mace* of the nutmeg; this substance is, when fresh, a crimson lacinated covering of the nut, which acquires its pale brown colour in consequence of the preparation it undergoes in being dried and prepared for market. The aril grows either from the stalk by which the ovule is attached, or from the micropyle; in the latter case it is often distinguished as the *arillode*.

ARIMANES. See AHRIMAN.

ARION, a native of Lesbos, the inventor of the dithyrambus, and a great musician, was contemporary with Periander of Corinth, and with Alyattes, king of Lydia (B.C. 628–571). One of the most elegant of the poetical myths of the Greeks bears witness to the greatness of Arion's power. It relates that having left Periander to visit Sicily, on his return home in a ship of Corinth, the sailors conspired to kill him and seize upon the rich prizes and presents which the Sicilians had showered upon him. Being warned of their design by Apollo in a dream, he requested permission to sing a pating song to the gods before casting himself into the sea. To this they consented, and after composing and singing a dirge, accompanying himself upon the cithara, he sprang overboard. Instead of being drowned, as they supposed, Arion was borne up by the dolphins whom his music had drawn round the vessel in a crowded shoal. Mounted on a dolphin's back he was safely borne to Tænarus, and proceeded thence to Corinth. The sailors had told Periander that Arion had remained in Sicily, but being confronted with him they confessed their guilt, and were put to death. Arion and his lyre formed one of the constellations (Lyra, in N. Hem. of constellations, on line 280; see PLATE CONSTELLATIONS); but Arion came afterwards to be called Hercules, and the Lyre was sometimes figured (upside down) as a bird.

ARIOSTO, LODOVICO, was born at Reggio, near

Modena, 8th September, 1474. He was the son of Nicolo Ariosto of Ferrara, a military officer in the service of Duke Hercules I. d'Este. Lodovico was the eldest born of a family of five brothers and five sisters. He early showed a disposition for poetry, and in his boyhood wrote a drama on the subject of Pyramus and Thisbe. Being designed for the profession of the law he was sent to Padua, where he spent five years, much against his will, in the study of that science; and his father, at last convinced of his distaste for this pursuit, recalled him home and allowed him to follow his own inclination. His father died about 1500, and Lodovico was left in charge of the family with a small patrimony. Having written several lyric compositions, both in Italian and in Latin, he attracted the notice of Cardinal Ippolito d'Este, who in 1503 appointed him one of the gentlemen of his retinue, and employed him in important affairs. But Ariosto had little taste for diplomacy, and still less for court intrigue. He returned to Ferrara about 1514, and resumed his studies.

Pulci, Bojardo, and Bello had each written a poem on the wars between Charlemagne and the Saracens, in which Orlando, or Roland, appeared as a prominent character, and the champion of the Christians. Bojardo took Orlando for the hero of his unfinished poem, and made him fall in love with Angelica, an infidel princess. Ariosto, in his great poem, the "Orlando Furioso," took up the thread of Angelica's story where Bojardo had left it, and making her fall in love with Medoro, an obscure youthful squire, he represents Orlando as driven mad by jealousy and indignation, continuing in this state during the greater part of the poem, until he is restored to reason by Astolfo. But the madness of Orlando is not the principal subject of the poem, although it has furnished the name for it. The war between Charlemagne and the Saracens is the main action, ending with the expulsion of the Moors from France. Intermixed with these subjects are numerous episodes of knights and damsels, of their fights and loves, of their strange adventures, some heroic, some ludicrous, and others pathetic: there are magicians and giants, enchanted palaces and gardens, flying horses and harpies; and the reader finds himself in the midst of a new world created by the wand of an enchanter.

Ariosto, after spending ten years in writing his poem, published it in one volume 4to, at Ferrara, in 1516, in forty cantos. In 1521 he published a second edition of his poems with many corrections, and in 1532, after correcting and revising his poem for sixteen years, he published the third edition in forty-six cantos, which, in spite of some misprints of which Ariosto bitterly complains, remains the legitimate text of the "Orlando Furioso." The "Orlando Furioso" has been translated into most European languages, though seldom successfully. Of the English translations, that by Harrington is superior to Hoole's, but Rose's is the latest and the best (1828).

In 1520, Cardinal D'Este having died, Ariosto took service under the Duke Alfonso, the cardinal's brother, and in 1522 was sent as governor to the mountain district of Garfagnana, on the western slope of the Apennines. Ariosto humorously describes the troubles of his government in his fifth satire. He remained nearly three years at Castelnovo, the chief town of the district, during which he seems to have conciliated the minds of that rude population, and to have restored order among them. In 1524 he returned from his government to Ferrara, where it appears he remained ever after, nominally in the duke's service, but enjoying leisure for his studies. He now wrote his comedies, which were performed with great splendour before the court, in a theatre which the duke built for the purpose. He died, aged fifty-nine, in 1533.

Ariosto is considered one of the best Italian satirists. The tone of his satires, seven in number, resembles Horace

rather than Juvenal. He introduces several of the principal occurrences of his life, and exhibits the manners and vices of his time and country. He wrote also five comedies in blank verse, and several minor works.

ARIOVISTUS, a German chief who crossed the Rhine to oppose the *Æduli*, at the request of the *Sequani*. He indeed freed the latter from their enemies, but retained a large part of their territory; and Julius Cæsar being appealed to by both *Sequani* and *Æduli*, attacked and defeated him (B.C. 58) so utterly that he barely escaped in a small boat across the Rhine (Cæsar, "De Bello Gallico").

ARISH or **EL ARISH**, a small town on a slight eminence about half a mile from the shore of the Mediterranean, and on the usual road from Egypt to Syria, 160 miles N.E. of Cairo. There are some wells near it, and some clumps of palm-trees between the town and the sea. Arish is the site of the ancient *Rhinocolura*, which was considered a kind of frontier town between Egypt and Syria, and in connection with Petra in the interior was an entrepôt of some importance. There are some Roman ruins and several marble columns still remaining. The French took possession of the town in February, 1799, in their expedition to Egypt, and kept it for some time. It was at Arish that Sir Sidney Smith concluded a convention with the French army, allowing them to return to France with their baggage and arms, which was subsequently disavowed by the British government. Population, 3000.

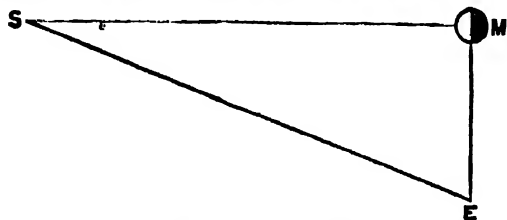
ARISTÆUS, one of the Greek gods, once a mortal, and deified because of the incalculable benefits he conferred upon mankind. He was the protector of flocks and shepherds, vineyards and olive groves; the inventor and patron of bee-keeping; and, in short, though his fame was less splendid than that of the Olympian deities, he was no less devoutly and widely worshipped, and with far better reason, since his action was uniformly beneficent. He was the father of *ACTÆON*, and was himself considered to be the son of *APOLLO*, by *Cyrene*.

ARISTARCHUS of Samos, an astronomer, lived about B.C. 279. We know nothing of his life or death.

Archimedes (in the "Arenarius") attributes to Aristarchus the opinion that the earth moves round the sun, which is supposed to have been previously held by Pythagoras and Philolaus. We learn also from Archimedes that Aristarchus supposed the apparent diameter of the sun to be the 720th part of the zodiac—that is, half a degree. This is only about 2' too little.

One small work of Aristarchus has come down to us, "On the Magnitudes and Distances of the Sun and Moon." It contains the celebrated method of finding the relative distances of the sun and moon, the earliest which was founded upon sound principles.

When the moon is exactly half illuminated it is obvious that the line *SM* is at right angles to the line *ME*. There-



fore, if we observe the angle $\angle M$ makes with $\angle S$, we know all three angles of the triangle $\triangle SME$, since $\angle SME$ must be the COMPLEMENT of $\angle M \& S$. And if we know all the angles we know the proportionate sizes of the sides. The method fails because of the rough surface of the moon, which renders it impossible to determine when she is exactly half

illuminated. Aristarchus made $\angle S$ to be twenty times $\angle M$, whereas we now know it to be twenty times twenty.

A new edition of the Greek text of Aristarchus, with a Latin translation, appeared at Paris in 1810, 8vo. There is also a French translation by M. de Fortia d'Urban (Paris, Didot, 1823).

ARISTARCHUS of Samothrace, the most celebrated of the Greek grammarians and critics, flourished about 150 B.C. He succeeded Aristophanes as head of the grammatical and critical school at Alexandria, and obtained, by his eminence as a teacher and by his various writings, a reputation so great that Horace and Cicero use the term "an Aristarchus" as a general name for a great critic. Even the invention of the Greek accents was attributed to him. It is fair to say, however, that this important discovery is claimed, apparently with reason, for his master, *ANTISTOPHANES* of Byzantium.

The numerous critical works of Aristarchus are now all lost, and they are only known from extracts and citations preserved by other writers. His chief work was his edition of the *Iliad* and *Odyssey*, in which he revised the text, partly by means of the comparison of MSS., and partly by conjecture. He divided the two poems into twenty-four parts or books, each distinguished by a letter of the Greek alphabet; and he placed certain critical marks before certain lines, some denoting that the verses so marked contained something worthy of notice, and others that they were spurious.

Aristarchus did not confine his criticism to grammatical and metrical questions, but he also gave historical and geographical illustrations of the author's text. He published two editions of his Recension of Homer, as appears from numerous passages in the "Scholia" to Homer, where the differences between the readings of the first and second editions are noticed. His edition became the established text of the *Iliad* and *Odyssey*, not only among the grammarians of Alexandria and their disciples, but among the copyists from whose transcripts the present texts of Homer have been derived.

Late in his life he appears to have retired from Alexandria to Cyprus, where, being afflicted with a dropsy, he died of voluntary starvation at the age of seventy-two.

ARISTATE, in botany, provided with a process like the awn of corn.

ARISTIDES, surnamed the *Just*, one of the noblest characters of antiquity, was the son of Lysimachus, and a member of one of the oldest and best of the Athenian families. The date of his birth cannot be ascertained, and of his early life nothing very precise is recorded. He attached himself to the aristocratic party in the Athenian state, under Clisthenes, and was a steady and determined opponent to the democratic leader THEMISTOCLES. On the occasion of the first invasion of the Persians, B.C. 490, he was one of the ten leaders of the Greek army at MARATHON, and by his prudent counsels beforehand, and his desperate valour during the conflict, contributed much towards the victory. After the battle he was left with the men of his tribe to collect the spoil, a duty he discharged with incorruptible honesty. The following year he was made chief archon, but six years later, B.C. 483, the influence of Themistocles caused him to be banished by the process called *OSTRACISM*.

Concerning this event, the story is told that while the voting was going on, an illiterate voter, not knowing to whom he was speaking, requested Aristides to write his own name upon the voting shell. "Have you been injured by Aristides?" said the statesman. "No," was the reply; "I do not even know him, but I hate to hear him always styled 'the just.'" Aristides quietly wrote his own name, as desired, received his sentence with dignity, and retired into exile with a blessing on his country. Thuc-

years afterwards (B.C. 480) the second Persian invasion took place under the personal conduct of Xerxes, who had succeeded his father Darius. Aristides was still in exile, but on the night preceding the battle of Salamis he undertook a perilous journey through the Persian fleet, in order to convey intelligence to his rival, Themistocles, of the danger in which he stood. In the battle itself he did good service, winning back the island Psyttaleia at a critical point. He was recalled at once, made general, and commanded as such at Plataea, B.C. 479, when the Persians were utterly crushed. In the year B.C. 477 he introduced that important change in the constitution by which all Athenian citizens were rendered eligible to the archonship without regard either to birth or wealth. The same year, being sent with Cimon to take command of the Athenian contingent serving under *PAUSANIAS* the Lacedæmonian, in the campaign against the European possessions of Persia, his wisdom made such a deep impression upon the allied Greeks, who had been disgusted by the pride and avarice of the Lacedæmonians, that they combined together, and offered the leadership to the Athenians. The task of making the necessary laws for this new arrangement, and of assessing the amount of the tax to be paid by each state, was committed to Aristides, and in the discharge of this duty he gained the highest praise by his moderation and equity. After a long life spent in the public service, and after occupying some of the highest offices of Athens, he died in the year B.C. 468, full of honours, but in such poverty, owing to his independence and absolute integrity, that he did not leave behind enough for his funeral expenses, which were accordingly defrayed by the state.

(See Plutarch, "Corn. Nepos," for life of Aristides, and Grote's "History of Greece" for an account of the time.)

ARISTIDES, a native of Thbes, and one of the great Greek painters, is said by Pliny (xxxv. 10) to have been the contemporary of Apelles. His excellence consisted in giving character and expression to his figures, and in the strong delineation of the passions. His colouring was hard. At the capture of Corinth by L. Mummius, Polybius, the Greek historian, saw the Roman soldiers playing at games of chance on the most costly pictures, which they had spread on the ground (Strabo, p. 381). Amongst them was a "Dionysus (Bacchus) with Ariadne," by Aristides. Strabo himself saw the Bacchus, after it had been repaired and safely transferred to Rome, in the temple of Ceres. He pronounces it a most beautiful work of art. It is worth noting, as additionally proving what the paintings at Pompeii indicate, that the ancients worked only in distemper, that this very picture was afterwards destroyed through M. Junius the prætor ordering it to be cleaned in preparation for the Ludi Apollinares, when all its beauty disappeared on the application of water. The value attached to the picture is further shown by the careful record of this regrettable occurrence.

ARISTIDES, QUINTILIANUS, perhaps the most valuable of the seven authors of ancient musical treatises whose works were collected by Meibom (Amst. 1652). Meibom thinks his date probably as early as the first century; but since Aristides quotes PROBLEMY (Claudius), he cannot well be placed before the third century; and other considerations would make him possibly of still more recent date. The lowest ancient scale began on the note we now call A (itself an added note to a scale still more ancient), and Aristides was the first to add G beneath it (Greek, *gamma*); so that, on the system of GUIDO, it always standing in mediæval times as the name of the first note of any scale, the lowest scale began on *gamma ut*, whence our word *gamut* for scale.

Aristides gives the ancient Greek notation in full for all modes, and both for singing and for playing—every note in Greek music having its special sign for each—and with the

great improvement over ALYPIUS of the notes being successively arranged in semitones instead of by keys, as in the older author. Some of the signs are different from those in Alypius. The twenty-eight notes comprised in all three modes of any single Greek scale (chromatic, diatonic, and enharmonic) Aristides considers to arise from the twenty-eight days of the month (lib. iii.), in the figurative fashion of the time. But the great value of the author is unaffected by such blemishes of the time in which he lived. He is one of the great authorities for the habit of the Greek orators of accompanying themselves with some musical instrument (lib. ii.), for the forms and varieties of the Greek lyre, and for many other matters beyond the mere notation of music. It is to be regretted that, like Alypius, he neglected to enrich his treatise with examples, the only known fragments of Greek music coming to us from another source. See GREEK MUSICAL SYSTEM.

ARISTIPPUS, the founder of the Cyrenaic school of ancient philosophy, was born of wealthy parents, at Cyrene, in Africa, about B.C. 425, and came to Athens when a young man, in order to profit by the lessons of Socrates. He made Socrates an offer of a large sum of money, which, as usual, Socrates declined. His affection for the philosopher was largely returned; yet he was essentially a man of luxury and pleasure, while the life of Socrates was simplicity itself. He remained with the great questioner until his death, though not actually present when Socrates took the poison.

Aristippus appears to have prided himself on his knowledge of the world, on the popularity and versatility of his manners, and the ease with which he could adapt himself to the company of all persons, and to all varieties of fortune. A characteristic anecdote of his fine manners is that in which, having discussed a question with *Æschines*, who was losing his temper, he said, "Let us now give over. We have quarrelled, it is true; but I, as your senior, claim the right to precedence—in the reconciliation." He lived some time with the world-renowned *Lais*; but though so prone to luxury, he avoided excess. Pleasure was his grand object in life, but he knew how to temper enjoyment with moderation. His principles and conduct made him obnoxious to Xenophon, with whom he is stated to have been on bad terms, and to Antisthenes, the founder of the Cynic school, whom he is reported to have constantly ridiculed for the austerity of his manners. Plato likewise aims a blow at him in the "Phædo" for passing his time in luxurious enjoyment at *Ægina*, while his master Socrates was under sentence of death at Athens at a distance of a few hours' sail. He seems to have remained true to the principle expressed by him in a conversation with Socrates (Xenophon, "Memorabilia," ii. 1), of keeping from his native country in order to avoid taking any share in public affairs. He travelled to various Greek states, and passed much time at the court of Dionysius of Syracuse. He probably retired late in his life to Cyrene, where we find his family and his school after his death.

Aristippus differed from Socrates and the Socratic philosophers, in taking money for his instruction. He dismissed with contempt all physical speculations, as subjects beyond human ken, and limited his speculations to the nature of man, and principally to the object of life.

Socrates always taught that happiness was the end and aim of all men; but that they erred because of wrong notions of happiness. Aristippus held that Socrates was too vague in his teaching on this point, and himself stoutly averred that the happiness of man consists in pleasure, and his misery in pain—happiness being merely an aggregate of pleasures, and misery an aggregate of pains. That pleasure is the greatest good he conceived to be proved, amongst other things, by the fact that the youngest children, and even brute animals, seek it, and avoid pain. He did not, like Epicurus, and like Socrates in the "Phædo," consider the

absence of pain to be pleasure, or the absence of pleasure to be pain; for he thought that pleasure and pain are accompanied with motion, whereas the absence of pain and pleasure is not accompanied with motion—the former of these two states being like the sleep of the soul. He did not recommend an unrestrained pursuit of pleasure—true wisdom (he thought) consisted, not in abstaining from pleasure, but in the proper enjoyment of it. He condemned all care for the past or the future, all regret and all forethought, and said that a person ought to think only of the passing day. He recommended calmness of mind and moderation of desires; and he particularly cautioned his daughter Arête against covetousness. He thought that the wise man should be free from envy and from love, from superstition, and from fear of death. His grandson (also called Aristippus) and one or two others followed this teaching, but the Cyrenaic school was never of great importance, and was swallowed up in the greater similar movement of Epicurus.

("Life of Aristippus," by Diogenes Laërtius, ii. 65–104, with Menage's notes; Wendt, "De Phil Cyrenaica," Gött., 1842; Lewes' and Ritter's Histories of Philosophy.)

ARISTOCRACY (from the Greek *aristokratia*), according to its etymology, means a government of the best or most excellent (Gr. *aristoi*). This name, which, like *optimates* in Latin, was applied to the wealthy class in the state, soon obtained a political sense; so that aristocracy came to mean a government of a *few*, the rich and well-born being always the minority of a nation. An aristocracy implies some nobility of birth and culture; simple government by the few is called *oligarchy*, a name and a system deservedly detestable.

Athens at the time of the Peloponnesian War had conquered many independent communities, which were reduced to different degrees of subjection. Nevertheless, as every adult male Athenian citizen had a share in the sovereign power, the government of Athens was called, not an aristocracy, but a democracy. Again, the Athenians had a class of slaves four or five times more numerous than the whole body of citizens; yet, as a majority of the citizens possessed the sovereign power, the government was called a democracy. An *aristocracy*, therefore, may be defined to be a form of government in which the sovereign power is divided among a number of cultured, wealthy persons—being less than half the adult males of the *entire* community where there is not a class of subjects or slaves, or of the *dominant* community where there is such a class.

Sometimes the word aristocracy is used to signify not a form of government, but a class of persons, in a state. When there is a privileged order of persons in a community having a title or civil dignity, and when no person, not belonging to this body, is admitted to share in the sovereign power, this class is often called the aristocracy, and the aristocratic party or class; and all persons not belonging to it are called the popular party, or for shortness, the people. This was the government of Venice from 1297 to her fall in 1797. (From 697 to 1297 the doges had almost regal power.) Under these circumstances many rich persons would not belong to the aristocratic class; but if the disabilities of the popular order are removed, and the rich obtain a large share of the sovereign power, then the rich become the aristocratic class, as opposed to the middle ranks and the poor. In England, at the present time, aristocracy, as the name of a class, is generally applied to the *rich*, as opposed to the rest of the community; sometimes, however, it is used in a narrower sense, and is restricted to the *nobility*, or members of the peerage. The use of the word *aristocracy* to signify a *class of persons* never occurs in the Greek writers, nor (so far as we are aware) is it ever employed by Machiavelli and the revivers of political science since the middle ages. Among modern

writers of all parts of Europe this acceptance has, however, now become established.

ARISTOGITON. See HARMODIUS AND ARISTOGITON.

ARISTOLO'CHIAEÆ, the Birthwort order of plants, consists of a small number of genera which principally inhabit the hotter parts of the world. They are in many cases used medicinally on account of their tonic and stimulating properties; and some of them are reputed remedies for the bite of venomous serpents. The flowers have a calyx of three segments, but no corolla; the ovary is inferior, and many-seeded; the parts of the flowers are in threes.

The most common plants of this singular order are the different species of *Asarum*, little stemless plants with dingy-brown flowers hidden among the leaves. The British genera are *Aristolochia* and *Asarum*.

The most valuable of the species is the *Aristolochia Serpentaria*, which grows in North America, chiefly in Virginia, and hence is called Virginian Snake-root. Though the whole root is used, the rootlets are more powerful than the solid root. Its odour and taste resemble valerian, angelica, and camphor. In its action on the human system it most nearly approaches to camphor, but its effects are more permanent. In protracted fevers, whether of a continued or intermittent kind, it is often eminently serviceable. In low nervous fever, and in small-pox, measles, and scarlet fever, it is often a valuable medicine, but should never be administered until after the use of proper purgatives. In some diseases not attended with fever, but causing torpor and exhaustion, produced by long continued or intense mental exertion, *Serpentaria*, either alone or in combination with quinine, is frequently very beneficial. This species, and several others in America, in the East and West Indies, and in Egypt, are much employed as antidotes against the bite of serpents; and hence the name Snake-root. *Aristolochia rotunda*, *Aristolochia longa*, *Aristolochia clematitis*, as well as the other species of the genus, possess emmenagogue virtues.

Aristolochia, like the *ARUM*, affords a good example of a *proterogynous* plant, that is, one in which the pistil passes its maturity before the shedding of the pollen, which is necessary to fertilization. This necessitates cross fertilization, which is effected by means of insects. The flower is tubular, with a narrow opening closed by stiff hairs pointing backwards. Insects covered with the pollen of another flower are attracted by the honey and enter the flower, which acts as a trap, the hairs preventing their escape. When the pistil has ripened so far as to be no longer capable of fertilization the stamens ripen and shed their pollen; the hairs shrivel up, and the insects with a fresh load of pollen pass out to fertilize another flower.

The flowers of *Aristolochia cordata* of South America measure 4 feet in circumference, and Indian children wear them in play as caps.

ARISTOMENES, one of the heroes of early Greece. He forms the principal figure in the second war of Messenia with Sparta. The first war had arisen through disputes between the borderers of Messenia and Laconia, which gave rise to a confirmed hatred. The men of Sparta secretly resolved on attacking Messenia, and they bound themselves by oath never to return home until Messenia was subdued. This was the commencement of the first Messenian war, which lasted twenty years, and ended in the complete subjection of Messenia. Aristodemus was the hero of this long contest, which ended only with his suicide from despair. B.C. 723.

In B.C. 685 a worthy successor to Aristodemus arose in the person of Aristomenes, a youth of the ancient royal line of Messenia, who, after thirty-nine years of Spartan tyranny, roused his countrymen to throw off the yoke. They offered him the crown, but it was refused; and indeed the success

which at first followed Aristomenes was suddenly checked in the third year of the war through the treachery of Aristocrates, the king of Arcadia, then in alliance with Messenia. Aristomenes retired into the fortress of Eira, and kept up thence a guerilla warfare for many years. At last he was taken with fifty companions, and all were cast living into a pit called Ceadas. All but Aristomenes were killed by the fall. For three days he lay waiting the approach of death; but at last he discovered a fox preying on the dead bodies, and by following it made his escape through a small hole. The Lacedæmonians could not believe that Aristomenes had escaped, until the rout, with great slaughter, of a body of Corinthian allies, on their march to join in the siege of Eira, convinced them that "Aristomenes and no other had done this."

In the eleventh year of the siege of Eira the fulfilment of an oracle warned Aristomenes that the contest could not be much longer protracted. One stormy night, when the vigilance of the Messenian sentinels was lulled by the violence of the tempest, the Spartans took possession of the walls. After a desperate conflict, Aristomenes collected the survivors, and placing the women and children in the midst, demanded, by signs, a free passage. The Spartans opened their ranks and let him pass, B.C. 668.

The remnant of the Messenians took shelter with the Arcadians. Bent on avenging his country, Aristomenes selected 500 men of approved courage, and formed the plan of assaulting Sparta by night, while the army was absent. Three hundred Arcadians volunteered to join them; but the enterprise was frustrated by Aristocrates, who sent intelligence of it to Sparta. This time his perfidy was detected, and he was stoned by his indignant countrymen. The office of king was at the same time abolished.

The defenders of Eira, joined by the Messenians of Pylus and Methone, now emigrated to Italy at the invitation of Anaxilas. They invited Aristomenes to go with them, but he determined to stay and to prosecute the war against Sparta. However, Damagetus, prince of Ialysus in Rhodes, being advised by an oracle to marry the daughter of the bravest man in Greece, selected the daughter of Aristomenes. Aristomenes went with her to Rhodes, and there died. The exploits of Aristomenes formed the subject of a poem by Rhianus, in which the hero made as conspicuous a figure as Achilles in the poem of Homer. (Pausanias, book iv. 6, &c.)

ARISTOPHANES, the famous Greek comic poet, was born at Athens about the year B.C. 444. According to Plato he was a lover of pleasure, but his bold and unsparring attacks upon the vices and follies of his times show that he was also a lover of his country, and a man of a fearless and independent spirit. His first comedy was written B.C. 427, before he was of sufficient age to contend for a prize in his own name, and was therefore brought out under the name of Philonides. It was entitled the "Dikaios," or "Banqueters," and gained the second prize. He continued writing until near the close of his life, producing in all fifty-four comedies, of which only eleven remain. These extend over a period of thirty-six years, and are entitled the "Acharnians," "Knights," "Clouds," "Wasps," "Peace," "Birds," "Lysistrata," "Thesmophoriazuse," "Frogs," "Ecclesiazuse," and "Plutus." These works of Aristophanes are all that remain to us of the older Attic comedy. The first of them, viz. the "Acharnians," was produced during the sixth year of the Peloponnesian War (B.C. 225), and represents the evils of war in comparison with the advantages of peace. The "Knights" (B.C. 424) was a satire directed against the Athenians, and especially the demagogue Cleon, whom he attacked with such bold ridicule that it is said no actor could be found sufficiently courageous to take the part, and no artist to make the necessary *mask*. The difficulty thus raised was overcome

by the poet appearing upon the stage, and sustaining the impersonation himself without a mask, his face daubed with wine lees to represent the flushed features of the demagogue. Cleon is not directly named, but is mercilessly lampooned under the figure of a sausage-seller who attempts to govern Demos (the people). The "Clouds" was first represented B.C. 423, but only gained a third prize. These two plays, the "Knights" and the "Clouds," are the best of his works, and serve to display all his powers of wit, fancy, humour, and satire; but at the same time they betray the fact that he was unable to fully understand the spirit that animated either the politics or philosophy of his own day. His representation of the democracy of Athens, and of those by whom it was led and controlled, in the "Knights," must only be accepted as a caricature of the reality. His treatment of Socrates by name in the "Clouds" is still more perplexing, and can only be accounted for by the supposition that he was unable either to appreciate the character or the teachings of that philosopher. The "Wasps" appeared B.C. 422, and was levelled against the prevalent love of litigation; and in the "Peace," produced B.C. 421, he again advocated peace with Sparta. The "Birds" was first exhibited B.C. 414, and is generally considered to be directed against the expedition to Sicily then under consideration, and which when carried out proved a disastrous failure. In the "Thesmophoriazuse," exhibited B.C. 411, the poet Euripides was held up to ridicule, and the attack was renewed in the "Frogs," brought out B.C. 405. The "Ecclesiazuse" (B.C. 405) satirized the political theories of Plato. The "Plutus" (B.C. 408) lashed the vices of the rich.

The year of the death of Aristophanes is unknown, but it was probably not later than B.C. 380.

Aristophanes is distinguished by an exuberant wit and an inexhaustible fund of humour, while his powers of mockery and ridicule are unrivalled. In the lyric portions of his works he displays a poetic spirit of the highest order, and a complete mastery of all the artifices of verse. He possessed a perfect command of language; and it is said that Plato held his works in high esteem as models of pure Attic, and that a copy of them was found under his pillow after his death. Where for comic purposes the rich stores of even this almost unrivalled language proved insufficient, Aristophanes coined words of his own. A pig is made to grunt for a whole verse in sounds which, even after all these ages, are mirth-provoking; and the "Brekekekex, koax, koax" of the "Frogs" is as true to nature now as when it was written over twenty-two centuries ago. But he also displays at times a gross indecency, concerning which the best that can be said is that it was possibly in accordance with the taste of his audience.

Of the text of Aristophanes, one of the most complete editions is that of Bekker, in five vols. 8vo (Lond. 1829). There is also a more recent edition by Bergk, two vols. (1867). The whole of the plays were translated into English blank verse by Wheelwright in 1887, and a literal translation by Hickie, in two vols., was published at London in 1853. There are also several translations of separate plays both in prose and verse, and a volume of the *Ancient Classics for English readers* (1872) is devoted to this poet.

ARISTOPHANES of Byzantium, the founder of the Alexandrine school of criticism, was perhaps born about B.C. 240. It is not known when he removed to Alexandria. The invention of the Greek accents, breathings, and punctuation are attributed to Aristophanes. He was the first who attempted to arrange the Greek writers into classes, according to the branches on which they wrote, and he separated those of the highest authority from writers of inferior merit. This canon of classical writers was afterwards corrected and confirmed by his pupil Aristarchus. See **ARISTARCHUS**.

Nothing of Aristophanes remains except what may form a part of the large commentary of Eustathius, the Venice "Scholia," &c.

(Villoison's "Scholia," II. l. 298, 424, &c., where Aristophanes' edition of the *Iliad* is referred to.)

ARISTOTLE (Aristoteles) was born in Chalcidice, at Stagira, a Greek colony from Andros, in B.C. 384, in the same year as the Athenian orator Demosthenes; they died also in the same year, B.C. 322. Nicomachus, the father of Aristotle, was the physician of Amyntas II., king of Macedonia, grandfather of Alexander the Great. In his seventeenth year, his father being then dead, Aristotle went to Athens; and when Plato returned from Sicily, in 365 B.C., he became one of his disciples. He soon so distinguished himself as to be named by Plato "the intellect of the school." This mutual admiration continued during life, although many attempts have been made to charge Aristotle with ungrateful conduct. He attacked Plato's opinions, but never Plato himself.

Aristotle remained at Athens twenty years, during which time he became a teacher of rhetoric, and made a violent attack on Isocrates, the great model of the art. In B.C. 347, the year in which Plato died, Aristotle went to Mysia with Xenocrates on the invitation of the eunuch Hermias, the ruler of Atarneus. He stayed there three years, till the death of Hermias through Persian treachery. Aristotle fled to Mytilene in Lesbos in B.C. 345, with Pythias, the adopted daughter of Hermias, whom he made his wife. In the only poetical effort of Aristotle which is extant (Diogenes Laertius, v. 7; Athenæus, xv. 16) he has celebrated the virtues of his friend Hermias.

Philip, king of Macedonia, in B.C. 342, invited Aristotle to undertake the education of his son Alexander, who was then thirteen years of age; and as a proof of his favour, Philip rebuilt, at the request of Aristotle, his native city Stagira, one of the thirty-two cities destroyed at the capture of Chalcidice. The mind of the pupil, who had a good capacity, was thus formed under the direction of one of the greatest thinkers that has ever lived. He acquired a taste for natural history, and the principles of philosophical, ethical, and political science, the influence of which operated on his future career. Aristotle never mentions his pupil in any of his extant writings. Their friendly relation existed, however, after Alexander set out on his Asiatic expedition; and the generous prince, besides assisting Aristotle to form his natural history collections by placing (so Pliny says, "Hist. Nat." viii. 16) all the huntsmen, fishermen, &c., of Macedonia at his service, presented him with 800 talents, estimated at £200,000 of our money.

Alexander was four years under the care of Aristotle, who returned to Athens B.C. 335, and remained there about thirteen years. Plato had been succeeded by Xenocrates, who was now the head of the Academy. Aristotle delivered his lectures in the gymnasium of the Lyceum just beyond the walls, outside the Porta Diocharia (see *PLATE ATHENS, ANTIQUITIES OF*), and founded the school of the Peripatetics, so called, it is said, because instead of remaining seated, as usual, he walked backwards and forwards in a shady place while delivering his instruction. After the death of Alexander, the enmity of the Athenians to the Macedonians broke out, the Lamian war followed, and Aristotle, who was a Macedonian, and was also accused of irreligion—the usual charge of all ages against men who seek the truth—withdrew to Chalcidice in Eubœa, where he died, B.C. 322, in the sixty-third year of his age. He was buried at Stagira, and his memory honoured by yearly festivals. He had a daughter, Pythias, by the sister of Hermias, and a son, Nicomachus, by Herpyllia. The events of his life were few; his sphere was philosophy, which, however, was based on practical

knowledge, in which he has had few superiors. His character was above reproach, though calumny, from the attacks of which no virtue is exempt, attempted to circulate slanders against him.

The influence of Plato and Aristotle on the development of science continues to the present day. But their systems were constructed from a different point of view. Plato's system was the ideal; Aristotle's was the real. To give an instance: Plato held that beyond all beautiful things there was The Beautiful; and, indeed, that things were only beautiful in so far as they possessed a share of this *idea*. Aristotle, on the other hand, declared that The Beautiful had no existence apart from beautiful things: we see that this has beauty, that that and the other have beauty, and the quality in which they are alike we call The Beautiful; but this is simply a generalization of ours, and not a reality. Yet with all his clearness of mind, Aristotle missed the grand distinction between subjective and objective, and hence remained obscure. The amazing fertility and variety of his, perhaps, unequalled mind still overwhelm the student of Aristotle. Even the extent of his reading was such, that many ancient authors are best known through the quotations carefully made by him. In the middle ages his authority was held supreme as the creator of all the sciences.

If Aristotle did not create the sciences, he gave to them a form. In his logical treatises he developed the laws which govern our mental conclusions. In his physical treatises he investigated the ultimate principles of motion, space, and time. In his natural history, &c., he laid the foundations of the sciences which have for their object the investigation of organized forms; the essential character of which is production of things like themselves. The nature of the mind was examined in his psychological works; and the nature of the will and of responsibility in his ethical treatises. His political treatises were not ideal constructions; they were the analysis, the resolution into their elements of the existing forms of society. He described 255 separate constitutions, and so exhaustively dealt with the subject that Dr. Arnold of Rugby declared, the "Politics" to be of everyday usefulness in this nineteenth century. The actual list is lost; we have only his conclusions from these data. He treated of language as a means of persuasion in his "Rhetoric," and of the theory of art in his "Poetic," said to be the most valuable relic of the ancient criticism. He gave to metaphysics its proper direction, by the investigation of ultimate principles in his "First Philosophy."

The value of Aristotle's philosophy is tested by its universality; it is not a Greek philosophy, nor a philosophy of a particular age. It has been read and studied in all ages and countries, in the language of almost every civilized people. It has been perverted, misapplied, and misunderstood. It has been described as something which it is not; appealed to as an authority to silence disputation and stop inquiry; and it has been depreciated in later times as purely dogmatic, unfertile in results, as if it were that which the Schoolmen made of it, and nothing more. And yet Aristotle still survives; some few devote themselves to understand and to expound him, to show that the value of the great master consists not in what he taught, but in his method; and that his mode of investigation, so far from being irreconcilable with modern science, is the sure path to discovery, if only we give to verification and experiment their due place.

The editions of Aristotle and of his several treatises are very numerous. The *editio princeps* is that printed at Venice by Aldus Manutius (1495–98, five vols. fol.). The best edition of the text is that of I. Bekker, or of the Berlin Academy (Berlin, four vols. 4to). Many of the separate treatises have been published from Bekker's text in

octavo. There is a complete English translation of Aristotle by Thomas Taylor (London, 1812, nine vols. 4to), with extracts from the ancient commentators on Aristotle, and a dissertation on Aristotle's philosophy. This translation, however, failed to gain the approbation of scholars, and it is now valued merely as a curiosity. A better translation was published by Bohm, forming part of the Classical Library. Leves' "Aristotle" is a comprehensive account of the philosopher. Mr. Congreve's edition of the "Politics" (London, 1855) is excellent.

ARISTOXENUS of Tarentum was one of the earliest Greek writers on music whose works have come down to us. His "Elements of Harmony," in three books, forms one of the most valuable parts of Meibom's famous collection of ancient musical writers ("Antiqua Musica Auctores septem," Amst. 1652). There is little earlier than Aristoxenus, besides the fragments of PHILOLAOS the Pythagorean.

Aristoxenus was not a musician alone, although in the poverty of writers on Greek music he is best known by his above-named treatise. He flourished late in the fourth century B.C.; and after the instruction of his father, Mnesius, had studied some years with the renowned Aristotle. Suidas, who narrates these particulars, adds that he attempted to rival his great teacher in the universality of his knowledge, and wrote altogether the prodigious number of 453 treatises—on music, philosophy, history, &c. Of all these only the "Harmony" remains complete; but this is probably one of his important works, since Vitruvius cites Aristoxenus as of equal authority in music to Apelles in painting among the ancients. The beautiful thought that the soul is the harmony of the body, bearing to it the same relation as the sound of a string does to the string itself, is due to this philosopher, and is cited by Cicero (Tusc. i. 10). Plato, in the "Phædo," has a similar analogy. Aristoxenus flourished at a time when the mathematical treatment of music by Pythagoras was beginning to be felt a burden; and he was the first to lay down the golden rule of a progressive art, that what satisfies a critical taste must be right, however contrary to established usage it may appear. A strong party of "musicians" (Gr. *mousikoi*) opposed the old-fashioned "theoreticians" (Gr. *kanonikoi*), and writings of both sides have come down to us. "Sense is but an uncertain guide," was the principle of the Pythagoreans—"numbers cannot fail." A scale tuned according to the proportions of Pythagoras admitted of no use of thirds or sixths, that is, of what we generally mean by harmony, for these intervals were harshly discordant; and further, it was not possible to pass from one key to another. Aristoxenus tuned his thirds and sixths more harmoniously, and by that very change brought keys into relationship, so that modulation from one key to another became possible. It is from this writer that we get our best knowledge of the chromatic and enharmonic musical systems of the ancient Greeks, though by this time the enharmonic had been long disused. See GREEK MUSICAL SYSTEM.

ARITHMETIC (from the Greek *arithmêtikê*), "the art of numbering," should mean the science of number in general, including a great part of what is commonly called *algebra*; it is, however, usually restricted to mean only the science of the expression of numbers by symbols, and the application (not investigation) of all rules relating to them which are useful in the arts of life. For the method of applying principles in practice, see the names of the various rules, ADDITION, SUBTRACTION, &c.; for the account of what we must call the metaphysics of arithmetic, see NUMBER, PYTHAGORAS, DIOPHANTUS; for the part of algebra which particularly concerns pure arithmetic, see NUMBERS, THEORY OF; for the arithmetic of concrete numbers, see WEIGHTS AND MEASURES.

We find ourselves in possession of a method of representing numbers so simple and powerful, that the principle

and practice of the most complicated rules follow from it with ease. It is so well known that we need not explain it; but when we separate from the rest the part which particularly distinguishes our NUMERATION from that of the ancient Europeans, we shall find that our superiority consists in the adoption of the following conventions:—

1. That the value of a figure depends not only upon the simple number for which it stands when alone, but upon the place in which it stands. Thus, in 888 the three eights mean respectively eight units, eight tens, and eight hundreds.

2. The place of a figure, considered as affecting its value, is determined by the column in which it stands; and in the absence of succeeding figures to indicate the existence of other columns, their place is supplied by ciphers, which of themselves are considered as having no value. Thus the 8 in 800 is of the same value as that in 868.

3. To complete our system, we must add that each figure is increased *tenfold* for every place which it is removed to the left. In the first two conventions consists what is called the "local value" of the figures; in the last is found the reason for the term "decimal notation" (from the Latin word *decem*, ten). The decimal notation or *denary scale* is not the only scale, possibly not the best one, but it is so familiar to us by long use that all others are difficult even of comprehension. There can be no doubt that it has arisen from the facility which the ten figures afford for making calculations. The names of numbers have been almost universally formed distinct as far as ten, after which compound names have been employed. The exceptions to the rule are additional proofs of the generality of the principle; they are either deduced from five or from twenty, the number of fingers on one hand, or the number of fingers and toes together. We call the simple symbols of numbers *digits*, or *fingers*; the Caribbees call the number ten by a phrase which signifies "all the children of the hand;" and in many languages the phrases for five, ten, and twenty are connected, either by direct derivation or common etymology, with those for the hand or fingers. In France the scale of spoken numbers from 60 to 100 is strictly vicenary (by twenties), and in the Indian Archipelago the ancient scales are vicenary.

Natural as it seems even to our children, with their inherited experience of the race, to count fingers and toes, the power to do so is far from universal amongst mankind; and since arithmetic depends, in the last resort, upon the grouping of units (that is, upon numeration), the arithmetical power in different peoples varies with this power of counting. Thus Galton ("Tropical Africa") found the Dammarra tribe unable to realize the conception of any number beyond 3, ideally. By help of their fingers they manage 4 and 5, but here they have to stop perforce, since there is no other hand free to grasp the fingers as they are counted! Yet they seldom lose their cattle, because they miss a beast at once by not finding its familiar shape. Galton says, "I have given a Dammarra four sticks of tobacco for two sheep (the rate of exchange being two sticks for one sheep), and have seen him put two of the sticks apart and take a sight over them at one of the sheep he was about to sell. Having satisfied himself that one was honestly paid for, and finding to his surprise that exactly two sticks remained in hand to settle the account for the other sheep, he would be afflicted with doubts—the transaction seemed to come out too pat to be correct—and he would refer back to the first couple of sticks; and then his mind got hazy and confused, and wandered from one sheep to the other, and he broke off the transaction until two sticks were put into his hand and one sheep driven away, and then the other two sticks given him and the

second sheep driven away." Here we see that the mind being unable to grasp "four," even "twice two" becomes absolutely impossible to conceive.

Aristotle mentions a tribe of Thracians which never counted higher than *four*. But the Brazilian Wood Indians (say Spix and Martius), the Bushmen (says Lichtenstein), the Murray tribes of Australia (says Beveridge), cannot reach beyond *two*. For instance, the last have but two words of number, *ryup* and *politi*; 3 is *ryup politi*, 4 is *politi politi*, 5 is *ryup marnangin* (one hand). We are inclined to smile; but since our *five* comes from the same root as the Greek *pente*, and since this is clearly identical with the Persian *pendjhi* or *pentscha* (a hand), we can see that our own race has but passed through, ages since, that state in which so many savage nations still exist. A curious limitation of the power of numbering, arising from the complexity of the expressions of simple numbers, occurs amongst the Yancos, on the river Amazon. Their word for *three* is thus formidable, "Poettarrarorincoarone." The remark of La Condamine ("Voyage de la Riv. des Amazons") is quite justified—"Hereusement pour ceux qui ont à faire avec eux, leur Arithmétique ne va pas plus loin." The Andaman islanders are so little advanced in intelligence that their language has no numerals at all. This subject is further developed under NUMERATION.

To enable our readers rightly to estimate the advantage which we possess in our notation, we will here describe that of the Greeks, which is only equalled by that of the Chinese in its near approach to the Indian, or generally received system, and is very much superior to that of the Chinese in the simplicity of its symbols. We shall omit the substitution of letters for numbers, and content ourselves with abandoning the principle of "local value," and substituting in its place such a system of symbols as, without departing from the principle of Greek notation, will not confuse the reader by the adoption of new digits. For the actual signs used by the Greeks, see the article NUMERALS. The first nine numbers would be represented as usual, but *ten* (instead of 10, in which 1 has local value), would be represented by 1', twenty by 2'', &c. So also 1''' would be one hundred, 2''' two hundred, and so on; 1'''' one thousand, 2'''' two thousand, and so on.

We now write some high numbers in our own decimal scale, accompanied by our imitation of the Greek.

4637 4''6''8''7 6007 6'''7

In the first number, *where there is no cipher*, the Greek looks so like our own that we might be led to imagine there was no essential difference. But when we come to look at the second number we see immediately that the continual derangement of the columns would prevent our rapid perception of the relative values of the numbers. The symbol of *vacuity* is wanting. Though perhaps 2', 3', &c., as we have used them, might have suggested such a contrivance, yet there was no analogy of form between the signs really used by the Greeks for 2 and 3 (β , γ), and for 20 and 30 (σ , λ).

The ingenuity both of Archimedes and Apollonius was employed in the extension of the preceding system, without alteration of its principle. That of the latter we shall imitate. Calling 10,000 M., let ten thousand times ten thousand be called M_2 , then ten thousand times that number M_3 , and so on; and let any one of these placed immediately after a number mean that the preceding is to be taken ten thousand times if followed by M_1 , ten thousand times ten thousand if by M_2 , and so on. The following number—

1768,9860,0142,0193 (our 1,768,986,001,420,193)

would then be represented by

1'''7''6''8M₂9'''3''6''M₁1''4'2M₁1'0'3.

The method of Archimedes (which preceded this) differed from it only in making ten million the *radix* of the system instead of ten thousand. He had been challenged to show a means of numbering the sands of the sea shore, and the "Psammmites," better known by its Latin title of *Arenarius* (*arena*, sand), was his reply, containing this system. We now see why our arithmetic was called *ciphering*, cipher coming from an Arabic word signifying *vacant*. One such thought as occurred to Archimedes in the bath [see ARCHIMEDES] might have been fourteen centuries gained to the science.

We look in vain for anything like local value in the system of the Egyptians, or any other nation of antiquity who are known with *certainty* to have very ancient records. That of the Jews was similar to the one just described, so far as it went; and the use of some letters common to both in the numeral system, but not so in the *alphabets* of the two, proves that the notation of both had a common source.

To the article NUMERALS we must also refer for the Roman system, which extended itself throughout Europe during the first twelve centuries. It is much more rude than the Greek, and is a sufficient proof of the well-known inaptitude of the former people for scientific invention.

The Chinese had several systems of numeration, all containing complicated symbols, and somewhat resembling that of the Greeks in principle; but with this important difference, that the symbol for 30, for example, has direct analogy with that for 3, being made by the juxtaposition of a symbol for 10; so that the improvement upon the Greek scale which we have been obliged to make in order to explain it renders our imitation of the Greek a better resemblance of the Chinese. But they have no written method of expressing local value; though their *Schwanpan* is a practical use of the principle.

We trace our own knowledge of the decimal system and "Arabic" notation direct to the Hindus, who themselves ascribe it to the Divinity. As to the manner of its introduction, there are some differences of opinion. One and the old account is, that Gerbert, afterwards Pope Sylvester II., found it in Spain among the Moors in the latter part of the tenth century. But upon this there are strong reasons for hesitating. Another and more probable account is, that Leonard of Pisa introduced it in 1202, in a work entitled "Liber Abaci," &c. And some have supposed that the ALFONSOINE TABLES, being constructed principally by Moors at the court of Alfonso, must have been the first in which the system appears. It is certain that this system had been before the twelfth century, and most probably as early as the ninth, in the hands of the Persians and Arabs, who ascribe it to the Hindus, and call it by a name which signifies "Hindu science." It is also certain that the Hindus themselves have long used it [see VIGA GANITA], and that it is easy to trace the manner in which our numeral symbols have been derived from those of the Sanscrit. In this latter language there are distinct names for *units*, *tens*, &c., up to what we should call *hundreds of thousands of millions of millions*. But whether we are to look to a Hindu for the invention is a question on which no surmise can be made till some probable account of the origin of Hindu literature can be given.

The steps by which the new notation made its way through Europe are not capable of being very clearly traced. Montfaucon found them in an Italian manuscript which was finished in 1317; and many manuscripts of the works of authors a century older contain them, but it is well known that it was usual to substitute the new figures for the old in recopying. There does not seem to be evidence of any general use of the Arabic numerals before the invention of printing; and even the works of Caxton do not contain them, except in a woodcut. Merchants continued their

accounts in Roman figures up to the sixteenth century. On the whole, we think that the general use of these numerals in scientific works did not much precede, if at all, the diffusion of algebra.

The only material addition which has been made to this groundwork of arithmetic is the invention of decimal fractions. This is an extension of the principle of local value, of so simple a character that it is surprising the Hindus never adopted it. They write fractions as we do, omitting only the line which separates the numerator and denominator.

The first fractional notation which we find among the Greeks consisted in writing the denominator where we now write the *exponent*. Thus, retaining our imitation, ²⁰⁷₃₆₅ would be written in the Greek signs corresponding to our figures $2\frac{7}{365}$. This system is principally used by

Diophantus; and in Eutocius we also find a peculiar symbol, something like π , for *one half*. Ptolemy made a further step, in the application to all units whatsoever of the method of dividing the circle, known by the name of the *sexagesimal* notation; thus giving a very much readier way of expressing fractions. The degree of the circle is divided into sixty minutes, the minute into sixty seconds, that again into sixty thirds, and so on; Ptolemy divides every unit in the same manner. We have still retained in our division of the circle the $^{\circ}$, $'$, $''$, &c., used by him. This sexagesimal notation retained its ground until the introduction of the Arabic numerals, and, with the aid of tables of reduction, was of material use. The best account of the history of arithmetic, and indeed of the general philosophy of numeration, is the essay of Dr. Peacock (dean of Ely) in the "Encyclopædia Metropolitana," which (except as to subsequent researches of travellers such as given in the present article) is exhaustive of the subject. See *Plates, NUMERALS*.

ARITHMETICAL PROGRESSION, a series of numbers which increase or decrease by equal steps, such as 1, 2, 3, &c.; 2, 4, 6, &c.; $1\frac{1}{2}$, 2, $2\frac{1}{2}$, &c. The difference between any two successive terms, being common to all, is called the common difference. The data which distinguish one arithmetical progression from another, are the *first term*, the *common difference*, and the *number of terms*; from these it is easy to find the last term and the sum of all the terms. To find the last term, multiply the common difference by one less than the number of terms, and add the first term to the product. To find the sum of all the terms, take the number of terms and the sum of the first and last; multiply the one by the other and divide the product by 2.

ARITHMETICAL SIGNS are arbitrary symbols used for the sake of brevity to denote the relations existing between numbers or the operations to be performed on them.

Of this the principal are $+$ (plus), the sign of addition; $-$ (minus), of subtraction; \times , of multiplication; \div , of division; $=$, of equality. Ratios are expressed by $:$ (read "is to"); for instance, 2 : 4 shows the relation in which "2 is to 4." Ratios are compared by $::$ (read "as"); for instance, 2 : 4 :: 4 : 8 shows that "2 is to 4 as 4 is to 8."

Multiplication is frequently expressed by a point; thus, 2 . 4 is the same as 2×4 ; but this may lead to confusion with the decimal point. This confusion not being possible in geometry the multiplying point is more common; thus, $AB \cdot BC$ is the general expression for the rectangular area measured by AB and BC (its sides) being multiplied together. Division and ratio are very often expressed by placing the numbers as a vulgar fraction; thus, $\frac{2}{4}$ is either the fraction two-fourths, or the ratio 2 : 4, or $2 \div 4$, since all these expressions convey the idea of the relation 2 has to 4. In Algebra, multiplication is expressed by simply

writing the symbols one after the other; thus $8A \cdot B$ means 8 times A multiplied by B .

Any power of a number (that is, the number multiplied by itself a certain number of times) is expressed by writing a figure above it a little to the right, and very small; thus, for instance, the second power or square of 9 (9×9) is written 9^2 ; the cube of 3 ($3 \times 3 \times 3$), 3^3 ; and the fifth power of 7 ($7 \times 7 \times 7 \times 7 \times 7$), 7^5 ; and so on.

Any root of a number is expressed by writing the sign $\sqrt{\quad}$ over it, and placing the number of the root as a small figure on the left of the symbol; thus the cube root of 8 (that number whose cube or third power is 8) is indicated by $\sqrt[3]{8}$. The square root is generally expressed by the sign $\sqrt{\quad}$ without the addition of the figure; thus $\sqrt{8}$ means the square root of 8. The same signs are also used in algebra.

Brackets are used very conveniently to couple together quantities which are desired to be dealt with as a whole; thus $3(4A + 2B)$ means 3 times the sum of $4A$ and $2B$, whereas $3 \times 4A + 2B$ would mean 3 times $4A$ with $2B$ added to the product.

ARIUS, the celebrated originator of the Arian heresy, was born in Cyrenaica, in Africa, probably about the middle of the third century. The year of his birth and the circumstances of his early life are unknown.

His first appearance in connection with the controversy to which he has given its name occurs A.D. 318, at which period he held the rank of presbyter in Alexandria, and was already renowned in that town of religious strife as a preacher. There had been for some years a growing divergence of opinion in the church concerning the divine nature of Jesus Christ. The doctrine of the Logos, as a secondary God become man in Jesus Christ, which originated in the school of Antioch, and which had for a very long period been the prevalent belief of the church, was now encountered by a disposition on the part of many of the Christian teachers to exalt the Son to an equality with the Father. Arius, who had been trained in the school of Antioch, regarded this teaching with apprehension, and earnestly maintained what he considered the old orthodox doctrine concerning the subordination of the Son. He now came into open collision with Alexander, the bishop of Alexandria, upon the subject.

Alexander, in a conference with his clergy, asserted the unity of substance in the three persons of the Deity. Arius in reply declared such a conception to be impossible to the human mind, and accused Alexander of falling into the error of Sabellius, and confusing the three divine persons. The controversy thus begun rapidly increased in extent, and soon awakened feelings of intense excitement in the church. A conference was called with a view of settling the dispute, but at this Arius asserted his views with such firmness that it only tended to make the difference more decided. In opposition to the bishop he asserted that though the Son was the first and highest of all created beings, born of God before the eternal periods, and by whom all things had been made, yet he was not of the same substance with the Father; for that substance being perfect would imply perfection in the Son, and thus involve the impossible conception of two Gods equal in everything. "There is," said Arius, "one God alone, without birth, alone eternal, alone unoriginate; and the Son, having been created by the Father, can neither be co-eternal or co-equal with him." The issue was now definite, and the dispute grew daily more bitter and violent.

Arius was supported by large numbers of the clergy and laity of the Eastern churches; but at a conference of bishops called at Alexandria in 321 his opinions were condemned, and he was deposed and excommunicated. He retired accordingly to Palestine to escape persecution, and from

there enlisted the active sympathy of Eusebius, the influential bishop of Nicomedia, a city of Bithynia (Asia Minor), who absolved him from the sentence of excommunication, induced the Emperor Constantine the Great to interfere in his behalf, and called another synod in Bithynia, which pronounced in his favour.

The contest between the rival parties, however, soon became so serious that the Emperor Constantine, after making several ineffectual attempts to mediate between the opponents, was constrained to summon the first great (ECUMENICAL COUNCIL, which was held at Nicæa, in Bithynia, A.D. 325, to settle the dispute. This is what is commonly called the Council of Nice.

Arius attended the Council and boldly defended his doctrines, but he was met by the most violent opposition from the majority of the inferior clergy present, and by the powerful reasoning and eloquence of the then archdeacon, ATHANASIUS (long held to be the author of what is called the Athanasian Creed). In the end the Council decided against Arius, and definitely promulgated the doctrine of the absolute unity of the divine essence, and the absolute equality of the three persons of the Trinity, in the well-known Nicene Creed. Arius and two bishops who sided with him were deposed and banished to Illyricum. All the writings of Arius were ordered to be given up and burned, under pain of death. His doctrines, however, were not so easily disposed of, and the decision of the Council was openly rejected in many of the churches. Arius had also powerful friends at court, the emperor's sister among them, and they procured his recall from exile in 328. In 330 he had an interview with the emperor, and succeeded in convincing him of his orthodoxy. Constantine therefore ordered Athanasius (now bishop of Alexandria) to receive Arius back into the communion of the church. This Athanasius stoutly refused to do; and after much rioting and violence, Eusebius, in A.D. 335, called a fresh synod of bishops at Tyre, deposed Athanasius, and prevailed on Constantine to send him into exile. He retired to Gaul. The people of Alexandria nevertheless maintained a firm resistance to Arius. In A.D. 336, therefore, he proceeded to Constantinople to protest anew his orthodoxy; and the emperor, satisfied, ordered Alexander the bishop of Constantinople to administer to him publicly the holy communion. The bishop, who was a vehement opponent of Arius, at first refused, but being overborne by the power of the emperor is said to have prayed that either he or Arius might die before the day appointed. Great preparations had been made for the event by Eusebius and the other followers of Arius, who regarded his admission as a triumph; but almost on the very steps of the cathedral Arius was taken suddenly ill, and died from a violent hemorrhage. This was regarded by his opponents as a divine judgment upon him, while his friends and disciples declared it to be the result of poison.

In person Arius was a man of noble appearance and graceful manners. He possessed extensive learning and great eloquence, was of ascetic habits, and undoubtedly animated by great courage and determination. The purity of his character was never assailed even by the fiercest of his opponents, though, as might be reasonably expected, he has been freely charged with envy, ambition, and dissimulation.

Some fragments of his "Thaleia" survive; and some of his letters, containing clear statements as to his doctrines, have been preserved.

After the death of Arius his friend Eusebius became bishop of Constantinople, and assumed the leadership. The party of the Arians at this time embraced a large number of the bishops of the East—those of the West for the most part holding with Athanasius. The party-word of the Arians was *homoiousios* ("similar in substance"),

while that of the Athanasians was *homoousios* ("identical in substance"), as expressive of the divine nature.

The Emperor Constantius supported the Arians in the Councils of Arles (354) and Milan (355), called to try and settle the long and bitter quarrel. It continued to rage, however, with unabated fierceness until Theodosius I., a thorough convert to the Nicene Creed, finally established this doctrine with all the force of the empire, as the orthodox belief of Christendom. Arianism lingered for some 200 years here and there, as among the West Goths, who had been converted by the famous Ulfilas, and in a few other parts.

In later times it has been adopted to some extent by individual teachers and a few eminent Christians, among whom may be mentioned John Milton, Dr. Samuel Clark, Whiston, Cudworth, and the Methodist scholar Dr. Adam Clark, whose denial of "the eternal sonship" was formally repudiated by that society; but it has never assumed any great influence, and must be regarded as an extinct controversy. For modern Anti-Trinitarian views see UNITARIANISM.

ARIZONA, a territory of the United States of America, organized in 1863. It is formed from that part of the old territory of New Mexico lying W. of 109° W. lon., being bounded on the S. by Mexico, on the W. by the Colorado River and California, and on the N. by Utah and Nevada. The United States first acquired a tract of the territory—about 30,000 square miles—for the sum of 10,000,000 dollars, to serve as a southern route for a railway to the Pacific; but by further acquisitions the state now extends over 112,000 square miles. Its length is about 400 miles, and breadth 330. The country is traversed by numerous mountain ranges, which extend generally in a N.W. direction from the Sierra Madre range of the Rocky Mountains. The principal ranges are the Carrezo and the Mogollon in the N.—having the peaks of San Francisco and Bill Wilham—and the Pinaleno Mountains in the S. The surface of the country is generally elevated, but slopes towards the W. and S.W. Much of the soil is sterile, but in the valleys there are good tracts of arable land, where maize, wheat, cotton, grapes, lemons, and tobacco are cultivated, and in many places two crops in the year are produced. In consequence of the long droughts which prevail, irrigation is, however, necessary to agriculture in most parts of the territory. Gold, silver, copper, mercury, and lead are found in various parts of Arizona in very large quantities. There is also abundance of salt, and coal and lime are found. Timber is not plentiful, except in the central mountain region and along the rivers, the chief of which are the Little Colorado, the Gila, and Bill William's Fork. Their waters all find their way into the Colorado proper, which on the N.W. boundary flows through a magnificent rocky gorge of 300 miles, the walls of which tower to a height of from 3000 to 6000 feet. The climate of Arizona is exceedingly salubrious throughout the year. Its inhabitants consist chiefly of various Indian tribes, to several of which fixed territories have been allotted, and they now till the soil. The total population in 1880 was 40,441. In 1870 the number was only 9568. The towns are inconsiderable in size, but the chief are Tucson, the capital, Prescott, the centre of the mining district, and Arizona city.

ARK, a chest or coffer. This term is frequently used by our earliest English and Scottish poets. In 1347, in the brewhouse of the priory of Lindisfarne, was an *ark* for meal, as we find by the inventory. The word is still in use in the north of England for the chest which is used to contain meal. Noah's ark was so named from its supposed resemblance to an ark or chest. The term *ark* is used in our translation of the Old Testament for the basket or cradle in which the infant Moses was laid when he was

put into the Nile. It is an Anglo-Saxon word, and it is also Latin (*arca*), with the same meaning; in fact, it occurs in so many of the Aryan languages that it is one of the recognized Aryan roots (\surd ARK), with the general sense of "to cover or protect."

ARK OF JEHOVAH. ARK OF THE COVENANT, ARK OF THE TESTIMONY OR REVELATION, the names given to the most important part of the furniture of the tabernacle and first temple of the Israelites. It is fully described in Exod. xxv., xxxvii., and appears to have been a small chest made of "shittim-wood" (generally supposed to mean *Acacia*), and overlaid with gold. Its dimensions cannot be ascertained with certainty, but it is supposed by many critics to have been 3 feet 9 inches in length and 2 feet 3 inches in breadth and depth. The lid was of solid gold, and was surmounted by two cherubim facing each other; it was called the mercy-seat. Two rings of gold were placed on each side of the body of the ark, and it was carried by means of two poles made of similar wood, also covered with gold. Within the ark were placed the two tables of stone engraved with the ten "words" or commandments, giving rise to the term "ark of the testimony or covenant." A Rabbinical tradition, accepted by the author of the Epistle to the Hebrews (ix. 4), made the ark the receptacle also of the golden pot of manna and of Aaron's rod that budded; but this receives no sanction from the Old Testament, and it is expressly stated that when the ark was placed in the temple it had nothing in it save the two tables of stone (1 Kings viii.).

The greatest solemnity was commanded in everything connected with the use of the ark. In the tabernacle and temple it was placed in the Most Holy Place—a small dark chamber shut off from the light of day, and only to be entered by the high priest upon the day of atonement. When moved from place to place it was hidden from sight by a covering of skins and of cloth.

The lid of the ark, or the mercy-seat, was regarded as the throne of Jehovah, and the spot between the cherubim was the place of the mysterious Shechinah or manifestation of the presence of God. After the entry into Canaan the ark appears to have remained for a time at Gilgal, whence it was removed to Shiloh; and though during the period of the Judges it appears to have been moved from place to place (2 Sam. vii. 6, and 1 Chron. xvii. 5), at the close of that period it was stationed at Shiloh, and from there it was brought into battle by the sons of Eli, and captured by the Philistines.

After its recovery it was at Kirjath-jearim until David brought it with great ceremony to Jerusalem (2 Sam. vi.) Here it remained until the erection of Solomon's temple, when it was brought into the most holy house with great state, including the offering up of many sacrifices. The cherubim in Solomon's temple were much larger than those originally made (2 Chron. iii. 10-13).

It appears to have been in existence in the reign of Josiah (2 Chron. xxxv.), but its ultimate fate is unknown. Various legends existed among the Jews concerning its disappearance, though the tradition that it was taken up to heaven to be restored upon the coming of the Messiah was more generally received among them. The ark was certainly never in the second temple, nor was any other constructed for that building.

By Christian theologians it has been regarded as being a type of Christ, and the details of its construction and the place it occupied in Jewish ritual are interpreted as being symbols of His work and mission among men.

It is worthy of notice that sacred chests or arks, bearing many resemblances to that of the Jews, have formed part of the worship of several of the nations of antiquity. The sculptured pictures of ancient Egypt contain many representations of carved ark or coffer which bears the most

exact resemblance to that of the Jews, with the exception that between the symbolical figures at either end is placed a truncated cone as a symbol of the creative power of Nature, while the cover or mercy-seat of the ark of Jehovah was unoccupied except by the cherubim.

AR'KANSAS, one of the United States of North America, is bounded N. by Missouri, E. by the river Mississippi, W. by the Indian territory, and S. by Louisiana and Texas. It lies between 83° and 86° 30' N. lat., and between 89° 30' and 94° 30' W. lon. It is 240 miles in length and 228 miles in breadth. The area is 52,200 square miles, or about the size of the whole of England. The population in 1830 was 30,388; in 1850 it was 209,639; in 1870 it had increased to 484,471; and in 1880 to 802,564.

The eastern part of Arkansas, bordering on the Mississippi, is low and swampy, generally covered with a dense forest, and is frequently flooded. The central part is undulating, with hills which gradually increase in height towards the W. till they become incorporated with the Ozark Mountains. These mountains enter the state from Texas, and, crossing it in a N.E. direction, extend into the state of Missouri. The soil is of great variety, from the most productive to the most sterile. On the margins of the rivers it is very fertile, but in many of the higher parts it is poor. Prairies are abundant and of vast extent. Cotton and Indian corn are the staple productions, but the country is also well suited for pasturage. In many parts there is a deficiency of water. In the low tracts the heat in summer is intense, and the climate moist and unhealthy; but in the central and western parts the air is dry and wholesome. Thunder-storms in summer are often terrific. Buffaloes, deer, elk, otters, beavers, raccoons, wolves, and bears are found, and wild geese, turkeys, and quails are abundant. The most important minerals are iron ore, coal, gypsum, and salt.

The principal river of the state is the Arkansas, which is navigable for steamboats to Little Rock, and when the water is high to Fort Gibson, which is W. of the limits of the state. The Red River forms a part of the S.W. boundary of the state. [See MISSISSIPPI RIVER.] The White River and the St. Francis River both rise in the Ozark Mountains of Missouri. The White River is formed by two main streams, the western called the White River, and the eastern the Big Black River. The united stream, under the name of the White River, after a southern course of about 400 miles, falls into the Mississippi 15 miles above the mouth of the Arkansas. The St. Francis River has a southern course between the White River and the Mississippi, and joins the Mississippi about 65 miles direct distance above the outfall of the Arkansas. The Washita, increased by the Saline and other tributaries has a southern course, and having been joined about 31° 30' N. lat. by the Catahoola and the Tenza the united stream then takes the name of the Black River, which empties itself into the Red River. Near the centre of the state there are numerous hot springs, the temperature of which sometimes rises almost to the boiling point.

The chief crops grown in Arkansas are maize, wheat, cotton, and tobacco, as well as apples and other fruits. The length of navigable river highway is about 8000 miles, and railways have been made to all the chief points. Formerly the state was almost entirely agricultural, but owing to the reclamation of waste but fertile lands, the rapid development of its mineral wealth, and the extension of railway communication, the manufacturing and industrial establishments in the district have greatly increased of late years.

Arkansas derives its name from a tribe of Indians, now extinct, who were called the Arkansan. It was first explored and settled by the French in 1685. In 1803 the

whole of Louisiana was purchased by the United States from France for 15,000,000 dollars, and it contained, according to the terms of the purchase, not only Louisiana, but Arkansas, Missouri, and the N.W. Territory. Arkansas seceded from the United States in 1861, and was engaged in the American war on the Confederate side.

ARKANSAS RIVER, the largest affluent of the Mississippi next to the Missouri, rises in the Rocky Mountains and joins the "father of waters" in $38^{\circ} 56' N.$ lat., $91^{\circ} 10' W.$ lon., after a course, following its bends, of 2170 miles. It has a general eastern course, and flows almost through the centres of the states of Colorado and Kansas, the Indian Territory, and the state of Arkansas. Generally speaking, the country is tolerably level, and great facilities are thus afforded for navigation. Steamers not drawing more than 4 feet can at ordinary times ascend the stream for a distance of rather more than 300 miles, but during the floods—which commence in March and attain their greatest height in June—it is navigable for boats for nearly 2000 miles, the difference in the level of the waters being as much as 25 feet. The Arkansas is joined by numerous large tributaries, the chief of which is the great Canadian River, which traverses the Indian Territory, and after a course of 800 miles unites with the main stream on its right bank. In the bluffs of the Canadian, as well as on the upper part of the Arkansas, extensive beds of gypsum are embedded in a ferruginous clay and a fine sand of a deep red colour. Owing to this, both these rivers are of a deep red colour during the floods. The waters of the Canadian, of its affluent the North Fork, and of the Upper Arkansas are of a greenish colour when not swollen by the rains. The Arkansas drains about 178,000 square miles of country.

ARKLOW, a seaport and market town of Ireland, county Wicklow, 14 miles S. by W. from Wicklow, stands on the south bank of the Ovoca, the scenery along the banks of which is remarkable for its beauty. It consists of a main street, called the Upper Town, which is well built, and runs parallel with the river, having a gentle descent towards the sea, near which is the part called the Fishery, consisting of cabins. A bridge of nineteen arches crosses the Ovoca. There is a handsome church in the Upper Town, and also a Roman Catholic chapel, besides schools, an hospital, barracks, and the usual county buildings. The shore is skirted by a line of low sand-hills, and the harbour can only be used by the boats employed in the herring and oyster fisheries, owing to a sand-bar. On the outlying sand-bank there is a floating light. The oysters, owing to a peculiar flavour, are shipped to Beaumaris in Anglesey, and there laid on banks before being fit for the market. The herring fishery has greatly declined. Chemical works have been built on the sands at the mouth of the river. Coals and provisions form the chief imports. Near the town is Shelton Abbey, the seat of the Earl of Wicklow. A monastery, of which no traces now remain, was founded here by Fitzwalter, who died in 1285. A fragment of the old castle of the Ormonds, destroyed in 1649 by Cromwell, still remains. A desperate encounter took place at Arklow between the royal troops and the insurgents in 1798. The population at the census of 1881 was 4398.

ARKWRIGHT, SIR RICHARD, was born at Preston, in Lancashire, on the 23rd of December, 1732, and being the youngest of thirteen children of humble parents, he received a very scanty education. He was brought up as a barber; but about 1760, at which time he resided in Bolton, he gave up that business, and became an itinerant dealer in hair, having become possessed of a valuable secret for dyeing and preparing it for the use of wigmakers. His first effort in mechanics has been supposed to be an attempt to discover the perpetual motion; but Dr. Ure hazards the plausible conjecture that, aware of the importance of his

cotton-spinning apparatus, he may, during his earlier experiments, have disguised the real character of his mechanism under that name. Down to about 1760 the cotton manufacture, although it had for some years been rapidly increasing in extent, was carried on under great disadvantages, with extremely rude and simple machinery, and mainly as a domestic employment. No mechanism was known by which cotton-yarn could be spun of sufficient fineness and evenness for use as the *warp* or longitudinal threads of a web, and therefore all the cotton cloths of English manufacture were formed of a mixture of linen and cotton; the former material being used for the warp and the latter for the *weft* or transverse threads only. Such cloths, which, being made in imitation of East Indian fabrics brought from Calicut, were called *calicoes*, were woven by cottagers, who received from the master manufacturers the necessary quantities of linen yarn and of raw cotton or cotton-wool, to be carded and spun into weft by the female members of the weaver's family by the tedious process of the spinning-wheel, which produced only one thread at a time. As the manufacture increased the carders and spinners became unable to keep pace with the weavers, who were sometimes compelled, in order to keep their looms at work, to pay more for their weft than their employers would allow them.

Conflicting statements, which cannot be fully entered into here, render it difficult to trace the history of the machinery by which Arkwright provided a remedy for this inconvenient state of things. It is, however, certain that in 1767 he employed a clockmaker named Kay, then residing at Warrington, to make a model, which was speedily followed by a working machine. This machine was first set up at Preston; but, fearing to encounter such riotous opposition as had been called forth shortly before by the introduction of Hargreaves' spinning-jenny, Arkwright removed it to Nottingham, where he obtained pecuniary assistance from the Messrs. Wright, bankers, and shortly entered into partnership with Messrs. Need and Strutt, eminent stocking manufacturers of that town. By this important connection the mechanical skill of Mr. Jedediah Strutt, who invented the contrivance by which Lee's stocking-frame was adapted to the production of ribbed stockings, was brought to bear upon certain deficiencies of the machine with great advantage. In 1769 a patent was obtained for the machine, the most important feature of which was the use of two pairs of rollers, technically called *drawing-rollers*, the first pair revolving slowly in contact with each other, and the second pair revolving in like manner, but with greater velocity. The lower roller of each pair was fluted longitudinally, and the upper one covered with leather, and the two were pressed together with a gentle pressure by means of weighted levers, in order that they might take sufficient hold of the soft cotton passed between them. The fibres of the cotton-wool were first laid smooth and straight by *carding* or *combing*, so as to produce a soft loose ribbon or cord called a *sliver*, the end of which was introduced between the first pair of rollers. In passing between them it received no further change than a slight compression, but as from them it was conducted to the second pair of rollers, moving with twice, thrice, or more times the velocity of the first pair, it was extended or drawn out to two, three, or more times its original length, its thickness being reduced in like proportion. As this action is effected by the sliding of the fibres upon one another, the distance between the two pairs of rollers must be so adjusted, in relation to the average length of the fibres, that the two pairs may never have hold of one fibre at the same time. Such is the beautifully simple principle upon which, with the aid of twisting, the thick soft sliver or carding is converted into a fine, hard, and compact yarn or thread.

Arkwright's spinning-machine was, in the first instance, worked by horse-power; but in 1771 the partners built a spinning-mill for working by water-power at Cromford, in Derbyshire, from which establishment, "the nursing-place," as it has been styled, "of the factory opulence and power of Great Britain," the machine took the name of the *water-frame*, and the yarn produced by it that of *water-twist*. It was in the arrangement of this establishment, the first of its kind, that Arkwright manifested that extraordinary talent for mechanical contrivance and adjustment, and for the no less difficult task of training human agents to take their places as part and parcel of a vast and complicated automatic apparatus, which earned for him the title of father of the factory system.

Notwithstanding the superior quality of the water-twist over other yarns, a superiority which rendered it available for use as warp, the prejudiced manufacturers formed a combination to oppose its use, and thus compelled Arkwright and his partners to commence the manufacture of it themselves, first into stockings and afterwards into calicoes similar in quality to those now used. This last-mentioned manufacture was commenced at Derby in 1773, but was for a time impeded, owing to the discovery that such fabrics, of cotton only, were chargeable with an excise duty of 6*d.* per yard, as being similar to those imported from India, while the common English mixed fabrics were charged only 3*d.*; and also that by an act passed in 1720 for the protection of woollen and silk manufactures, no such fabrics of cotton might be "printed, painted, stained, or dyed," although by a subsequent act passed in 1736 an exception was made in favour of such as had the warp of linen-yarn. After great difficulty and expense, occasioned by the opposition of other manufacturers, Arkwright and his partners obtained the repeal of these provisions in 1774 by an act which recognized the new manufacture, and placed it on the same footing as that of mixed calicoes.

The invention of the machine for spinning by rollers was followed up by various improvements in the mechanism for carding and for other processes in the cotton manufacture, for which Arkwright obtained a second patent in 1775. As, however, the cheapness and beauty of the new cotton fabrics had by this time led to an extensive demand, the hostile manufacturers altered their tactics, and instead of endeavouring to put down Arkwright's inventions, they soon began to dispute his claim to them, and to appropriate them in defiance of his patent rights. The use of his new mechanism was extended in the course of a few years, by *licenses* granted by the patentees, to a very great extent; and this circumstance rendered piracy more easy. In 1782 Arkwright computed that the new manufacture already employed upwards of 5000 persons and a capital of £200,000. In some cases the new machinery was destroyed by mobs, whose violence was connived at, if not encouraged, by the higher and middle classes; while in others the unauthorized use of it without payment to the patentees was carried to such a length that in 1781 Arkwright was compelled to bring actions against nine different parties to test the validity of his second patent. He lost the first of these, on the ground of the alleged insufficiency of his specification, and in consequence of this decision he abandoned the remainder.

Other trials followed in 1785, ending in Arkwright losing his patent; and it was on the last of these that evidence was adduced with the intention of stripping him of all merit as an inventor, and representing him as a grasping and ungenerous plagiarist of other men's ideas. The evidence, however, upon which it has been attempted to condemn him abounds in inconsistencies and suspicious circumstances. The principal witness against him, his former assistant, Kay, was evidently a man of no character, who had parted from him under circumstances involving a

charge of felony, and who, if his own testimony were true, must have himself pirated and made known to Arkwright the invention of a former employer. Still more recently the details of an invention unquestionably of prior date have been brought forward to invalidate Arkwright's claim; but it is also clear that, after experimenting for twenty or thirty years, Wyatt and Paul, the possessors of this mechanism, were unable to turn it to practical account. Of the claim to be considered the *first* inventor of spinning by rollers Arkwright is undoubtedly deprived by this prior scheme; but it can hardly, we conceive, be taken to deprive him of his merit as an inventor.

Prosperity continued to attend the establishments of Arkwright and his partners, notwithstanding the adverse decisions of the courts. His partnership with Mr. Strutt terminated in 1788, after which time he retained the works at Cromford, which were subsequently carried on by his son, while Mr. Strutt continued the works at Bolper, which were founded about 1776. How greatly the cotton manufacture extended under the stimulating effect of his improvements may be conceived from the fact that the imports of cotton-wool, which averaged less than 5,000,000 lbs. per annum in the five years from 1771 to 1775, rose to an average of 25,443,270 lbs. per annum in the five years ending with 1790.

Little is recorded concerning Arkwright's private or personal history. In early life he married Patience Holt, of Bolton, who, in December, 1755, became the mother of his only son, Richard. After her death he married again, either in 1760 or 1761, his second wife being Margaret Biggins, of Pennington, in the parish of Leigh; and from this wife, who is the only one mentioned by most biographers, he separated, but when or under what circumstances is not very certain. It is said to have been in consequence of some disagreement arising from his adventurous scheming disposition; but very little reliance can be placed upon the gossip circulated respecting this and other points of his history. In 1786, on occasion of presenting an address to George III., after the attempt on his life by Margaret Nicholson, he received the honour of knighthood; and in the following year he served as high-sheriff of Derbyshire. He long suffered from asthma, and died of a complication of disorders on the 3rd of August, 1792, in his sixtieth year, leaving property amounting to little short of half a million. His son Richard inherited his father's sagacity and aptitude for business, and became, it has been asserted, the wealthiest commoner in England. He died on the 23rd of April, 1843, in his eighty-eighth year, leaving a large family; and his property was sworn, on the proving of his will, to exceed £1,000,000—that being, however, merely a nominal sum, taken because the scale of stamp duties then went no higher. In fact, it was generally understood that his heir came into possession of at least £8,000,000.

ARLES (*Arelate*, Cæsar; Gr. *Arelatai*, Strabo; by the poets *Arelas*), the chief town of an *arrondissement* in France, in the department of Bouches du Rhone, 53 miles N.W. of Marseilles, and 483 miles from Paris by railway. The town is on the left bank of the Rhone, just at the point where the river, dividing into two channels, incloses the marshy island of Camargue. The streets are generally narrow and irregular. A bridge unites it with the suburb of Trinquetaille, on the opposite bank of the Rhone. There is a large cathedral with some interesting cloisters, the churches of Notre-Dame and St. Honorat, and a town-hall, built in 1673, after the design of the architect Mansard. There are also a museum of antiquities and a public library, which contains 12,000 volumes.

The environs of Arles are extremely pretty, and contain many beautiful promenades. The vast remains of the abbey of Mont-Majeur, and near it the beautiful chapel of

St. Cross, founded in 1019, are about 2 miles N. The surrounding marshes, which formerly rendered the town unhealthy, have been thoroughly drained.

The situation of Arles on the banks of the Rhone gives it considerable advantages for trade. In order to provide better communication with the sea, the navigable canal of Arles, 25 miles in length, was constructed from the city to Port du Bouc on the Mediterranean. There is also a connection with the canal of Beaucaire and with the river Durance, as well as good railway accommodation. The corn, wine, fruits, manna, cattle, soda, salt, wool, and oil of the surrounding country find sale here; railway waggons are built in large numbers; and there are manufactures of glass bottles, soap, silk, tobacco, and brandy. There is a very active coasting trade, merchant steamboats ply regularly to Marseilles, and passenger steamers go up the river to Avignon, Lyons, and Seyssel. The population in 1882 was 27,000.

The claims of Arles to notice rest mainly upon its former greatness and its numerous existing antiquities. It is first mentioned by Cæsar ("Bell Civ." i. 36, ii. 5), who built here twelve ships of war, previous to the siege of Massilia (Marseilles). Strabo and Pomponius Mela describe it as a place of great trade and prosperity. The city suffered from the Allemanni during the decline of the Roman empire, but in the early part of the fourth century it rose to distinction under Constantine the Great, who gave it the name of Constantina, which it continued to bear in the time of Honorius, when it became the seat of the prætorian prefect of Gallia. Arles was the residence of a king of the Visigoths, and of a prefect under Theodoric, king of the Ostrogoths. Under the Merovingian kings, who became masters of Arles after the Ostrogoths, the city declined. In the twelfth century Arles passed under the dominion of the emperors of Germany; and became, in 1212, a republic, governed by a chief entitled *Podestat*, who was elected by the people. Under this constitution it flourished greatly; but its independence was overthrown, in the middle of the same century, by Charles I., count of Anjou, who was recognized as lord of Arles, in feudal subjection to the Emperor of Germany. About a century afterwards the city, with its territory, came finally under the kings of France. Several ecclesiastical councils have assembled here; at that held in 814 the Donatist heresy was condemned. An archbishop of Arles consecrated St. Augustine, who became the apostle of Christianity to the Anglo-Saxons.

Of the antiquities of Arles the following may be mentioned:—The amphitheatre, a magnificent structure capable of containing 24,000 spectators, was in the eighth century converted into a fortress, and over each of its four gates towers were erected, of which two still remain. Shan bull fights are still held in the amphitheatre on Sundays. Amongst other relics, the celebrated statue of Venus, now in the Paris Museum, was discovered in 1651, in the ruins of the Roman theatre, which are very extensive. Besides these, ruins of a triumphal arch, an aqueduct, and two temples have been found. There is also a cemetery, called by the ancients *Elysii Campi* ("Elysian Fields"), the name being traceable in its modern designation, *Elicamps* or *Aliscamps*. It still contains several ancient tombs, those of pagans being distinguished by the letters D.M. (*Dii Manibus*), and those of Christians by a cross and D.O.M.

ARLON (the Roman *Orolaunum*), the capital of Belgian Luxembourg, a neat and prosperous town, is situated in the midst of forests near the sources of the Semois, a branch of the Meuse, 14 miles N.W. of the town of Luxembourg, with which it has railway communication. It has some iron-works and furnaces, a considerable corn trade, and manufactures of linen and woollen, leather, tobacco, and earthenware. The most remarkable building in the town is the former Capuchin convent, which is not

now, however, used as such. Arlon was formerly fortified, and was joined to the countship of Luxembourg in 1214. It was taken and retaken by the French and the Spaniards in the wars of Louis XIV. It was almost destroyed by fire in 1785. Various Roman remains have been found near the town. The population is 7200.

ARM. The human arm consists of the shoulder, upper arm, forearm, and hand. The shoulder is composed of two bones, the collar-bone and the shoulder-blade, whereof the first only is articulated with the trunk. It is somewhat the shape of an old-fashioned *f*, and so resembles an antique key in appearance that its scientific name is *clavicula* (Latin, key). It is figured in our Plate I., fig. 4. At *a* is the flattened surface by which it articulates with the breast-bone, and at *e* is a small surface, also flat, for the articulation with the shoulder-blade.

As stated, the shoulder-blade (scapula) is connected with the trunk, so far as articulation is concerned, only by the collar-bone. It is a large thin bone of an irregular triangular form, and is shown in our Plate I., figs. 1, 2, and 3. Its function is to cover and protect the chest from behind, like a bony shield. The line *bac* is called the base, and lies parallel to the spine; the upper edge is nearly vertical, and the edge *dc* is diagonal. At the upper end of the latter is the glenoid cavity, *d*, which receives upon it the head of the *humerus* or upper arm. From the upper edge of the shoulder-blade extends the bony *coracoid* process, *f*, shielding the articulation of the humerus just named. The back view of the shoulder-blade (fig. 1) shows at *h* a prominent projecting ridge (the spina of the scapula), which rises on the diagonal edge about an inch from the top; and crossing it, increasing in height as it proceeds, it unequally divides the surface, and ends in an overhanging flange, *i*, called the point of the shoulder (acromion), on the front of which is a small flat surface for the articulation of the collar-bone.

The collar-bone of each side is fastened to the upper part of the breastbone by a ligamentous capsule divided by an interarticular cartilage hollow on both sides, a structure always found where great extent and variety of motion are needed; but at the hinder extremity, where it articulates with the shoulder-blade, there is required only a yielding motion, and a simple ligamento-cartilaginous structure therefore joins the two. The similarity between this system and the bony ring of the pelvis is at once seen; the difference being that unlike the iliac portion of the pelvis, the shoulder-blades are connected with the spine by muscles only, because here great motion is required as contrasting with the solidity and strength needed in the pelvis.

The function of the shoulder, then, seems to be to keep the arm away from the trunk, so that it may freely move; for however great the motion, the glenoid cavity, *d*, can never be drawn very near the chest. Were the collar-bone absent the shoulder-blade would rest on the side of the chest, and the arm could not be carried across the body and raised to the mouth. It could (as in all animals without a clavicle) swing to and fro, for purposes of walking, but no more. [See *ARMADILLO*.] Hence all animals whose fore limbs are prehensile have a collar-bone.

The upper arm (*humerus*) consists of a single bone, hanging from the glenoid cavity of the shoulder-blade and ending in the elbow. It is of an irregularly twisted cylindrical shape (fig. 7). The shoulder-joint (fig. 8), formed by the shoulder-blade and the upper arm, is, next to the hip, the most perfect ball-and-socket joint in the body. It is considerably shallower than the hip, and therefore capable of freer motion. At the same time it is not so secure, and is "put out" by accidents much less severe. It is one of the tendons, *c*, of the biceps muscle, which, passing over the head of the upper arm, *b*, is the principal means of fastening the latter into its sockets.

Therefore when a strain is thrown on the joint by lifting a heavy weight, the muscle, which pulls by one end on the forearm and by the other on the shoulder-blade, absolutely strengthens the shoulder joint, drawing the bones more firmly together. The point of the shoulder (acromion) above, and the great muscles of the shoulder all round, afford protection to the joint.

The motions performed at the shoulder-joint consist of swinging either backwards or forwards, elevation, depression, circumduction, and a rotatory motion combined of all four (the head of the humerus revolving in the glenoid cavity with little actual change of position). If the arm is held out horizontally it can be moved backwards and forwards; if it hangs to the side a rotatory motion round its own axis, like the turning of a spindle, can be performed, and many other movements could be named. When the motion is violent, as in throwing, striking, &c., the shoulder also comes into play and moves on the sternal end of the collar-bone, giving a great additional power of swing to the arm.

The forearm extends from the elbow to the wrist, and has two bones, the ulna and the radius. These Latin names are now nearly always used instead of the English "cubit" and "spoke-bone" which roughly translate them.

The ulna (fig. 6) connects the upper arm with the forearm. It is irregularly triangular in section for the most part, with a cavity called the sigmoid at top, *a*, which exactly fits and turns upon the pulley-like head of the humerus (*i*, fig. 7), and is protected by the *olecranon* (*b*) or point of the elbow. This last is what projects when the elbow is bent, but drops into the deep cavity just above the head of the humerus when the elbow is straightened. In the smaller cavity, *c*, is received the head of the radius, and the other end of the radius turns on the rounded articular surface at *g*. The little stud at *i* is called the styloid process.

The radius (fig. 5) is on the outer side of the forearm, and is called a "spoke" because it is the turning-bone of the arm. Its head, besides articulating with its fellow-bone of the forearm, also articulates with the upper arm. It increases in size as it descends to its base, *d*, and is concave both ways on the base for the reception of the outer two upper carpal bones. Inside the base is a shallow semilunar cavity where it turns upon the ulna.

The elbow-joint (fig. 9) is shown with its ligaments; it hardly needs explanation, being a simple hinge-joint, and the two bones moving almost as one. But to prepare for the motions of the wrist there is a very beautiful contrivance (fig. 10). The circular coronary ligament, *e*, forms a collar round the neck of the radius, close to the elbow, confining it in the sigmoid cavity of the ulna, and therefore compelling it to move like a pivot in a socket, whilst the base of the radius is free to travel round its curved articulation on the ulna in a semicircle, carrying the wrist with it. The surface of the ulna is concave to the radius at the elbow, and that of the radius concave to the ulna at the wrist. For the wrist and hand, see HAND.

Fig. 15, Plate I., gives all the bones in their proper position:—*A*, clavicle; *C*, *K*, ridge or spine of the scapula; *U*, fossa above the spine; *E*, acromion; *D*, scapula; *F*, edge of the glenoid cavity; *G*, *H*, *I*, *J*, humerus; *K*, *L*, *M*, ulna; *N*, *O*, *P*, radius; *K*, olecranon; *Q* to *W*, wrist; *X*, metacarpus or hand; *Y*, fingers.

The arms are the anterior pair of appendages or limbs on the skeleton of the Vertebrata, and possess the same characters throughout, in the main, though often disguised externally almost beyond recognition. Thus the humerus is wanting in most fishes, but the radius and ulna, wrist and digits, are represented, the latter by the rays of the pectoral fin. The radius and ulna join to make one bone in the "frog", but otherwise the limb is perfect. On the other hand, it is absent altogether in snakes (the rudiments

of hind limbs exist), these creatures moving on the ends of their ribs. In birds, quite a new development is gained, and the arm becomes a wing: the scapula (shoulder-blade), as a rule, is a simple long bone not spined: the coracoid is no longer a process of the scapula, but an important distinct bone, and the two clavicles meet in the well-known form of the "merry-thought": the coracoids are the great bones of the shoulder-girdle, which, by their articulation with the sternum, form in birds a complete ring. It has been above observed that this ring is not complete in man; and the junction is not even in birds obtained through the scapulae, which remain free at their further extremity as in man, but by the coracoids. By the reduction of the wrist to two bones (one for the radius and one for the ulna) the motion of the "hand" in birds is limited to the folding and unfolding of the wing; great strength is thus gained to the stroke of the wing upon the air. The "fingers" are united into one digit, to which is usually added a "thumb," which carries the "bastard wing," and sometimes bears a claw.

In Mammals the shoulder-blades broaden out, and the collar-bones never unite. The hoofed animals, the whales, and the sloths have no collar-bones; but the remainder of the limb, even in the whales (which have no hinder limbs) is always well represented. The forearm is in no mammal so perfect as in man; some, as the whales and bats, having the two bones joined into one, and none except the monkeys possessing the power of pronation and supination of the wrist. The use of the limb is generally, except in man, for progression—but in very various ways. The upper arm is inclosed in the skin of the body in the hoofed animals, making the forearm appear to be the upper arm, and what is actually the wrist seem like an elbow; and it will be seen on reference to our Plate HONSE, therefore, that these animals really walk on the tips of their nails. Bears and monkeys walk on their palms and soles, the Carnivora on their fingers only, not on the tips of them, but on their palmar surfaces, with the body of the hand bent up away from them. No animal possesses the free thumb of man (on the other hand, the great toe is a much freer digit in the monkey than in man), but this is the greatest absolutely special anatomical character he boasts. His true superiority is mental, not bodily. By frame he is one, and only one, of the great kingdom of Vertebrates, but by his mind he stands alone, separated by an immeasurable interval from any other of God's creatures.

It remains only to give a brief account of the muscles moving the arm.

The act of shrugging the shoulder—that is, of raising the collar-bone and shoulder-blade—is performed by the trapezius. The shoulder is tilted down by the levator-scapulae, which pulls up the inner angle of the shoulder-blade, consequently lowering the outer angle. The rhomboideus draws the shoulder-blades together. The serratus magnus, so called from its serrated or saw-like appearance where it arises from the nine upper ribs, draws the shoulder-blade forwards and downwards, antagonizing the rhomboideus and levator. (See Plates, MUSCLES OF THE HUMAN BODY.)

The movements at the shoulder are caused by muscles (figured in ARM, Plate II.) acting as follows:—The arm is *flexed* (bent across the chest) by the pectoralis major (fig. 19 *a*) and coraco-brachialis (fig. 19, *i*) and the anterior fibres of the deltoid (fig. 18, *c*). It is *extended* (bent behind the back) by the latissimus dorsi, fig. 19, *b* (the largest muscle in the body, covering all the lower part of the back, and passing round under the arm-pit to its insertion in the humerus), *teres major* (fig. 18, *f*), and posterior fibres of the deltoid. It is *adducted* (brought to the side) by its own weight, by the pectoralis major, latissimus dorsi, *teres*, and coraco-brachialis; and *abducted* (raised from the side) by the deltoid and supra-spinatus (fig. 18, *d*),

a deep-seated muscle arising from the *spina* of the shoulder-blade, whence its name. *Rotation* of the arm upon the circular hollow surface of the shoulder-joint (the glenoid cavity) is produced outwards by the other *spinalis* muscle (*infra-spinatus*), fig. 18, *e*, and *teres minor* (fig. 19, *h*), inwards by the *subscapularis* (fig. 19, *g*), *teres major*, *latissimus dorsi*, and *pectoralis major*. The last two muscles are antagonistic, in that the pectoral draws the arm across the chest after rotating it, whilst the *latissimus dorsi* draws it behind the back.

The forearm is *flexed* (bent on the upper arm) by the *biceps* (figs. 19 and 21, *k*), *brachialis anticus* (fig. 21, *l'*), and *supinator longus* (fig. 22, *a*), and indirectly by the flexors of the wrist and fingers (fig. 21, *n*, *o*). It is *extended* (straightened) by the *triceps* (fig. 19, *j*) and *anconeus*, and indirectly by the extensors of the wrist and fingers (fig. 22, *g*, *r*). *Rotation* of the radius upon the ulna and humerus, and consequently *pronation* (back upwards) and *supination* (palm upwards) of the hand are produced as follows:—*Pronation* by the pronator quadratus (fig. 23, *b*) and pronator *teres* (fig. 23, *a*); *supination* by the *biceps*, *supinator brevis* (fig. 22, *b*), and very feebly by the *supinator longus*.

Altogether there are 54 muscles to the arm (that is, of course, to each limb, both right and left, separately)—8 connecting the arm to the trunk, 9 connecting the arm to the shoulder-blade, 12 connecting the upper arm to the forearm, 6 connecting the forearm to the hand, and 18 on the hand itself. For explanation of the figures of the latter, see *HAND*.

ARMADA, SPANISH. In the beginning of May, 1588, the preparations of Philip II. for the invasion of England, which had so long kept Europe in amazement and suspense, were brought to a conclusion; and the Spaniards, in the confidence of success, previous to its sailing, gave their fleet the name of the *Invincible Armada* (armed force). It consisted at this time of 130 vessels. Sixty-five of these were galleons and larger ships; twenty-five were pink-built ships; nineteen tenders; thirteen small frigates; four were galleasses; and four galleys. The soldiers on board amounted to 19,295, the mariners to 8050. Of these 3330 soldiers and 1293 mariners had been supplied by Portugal; besides which the rowers in the galleasses amounted to 1200, and in the galleys to 888. There were also on board 2431 pieces of artillery, and 4575 quintals of powder; 347 of the pieces of artillery had likewise been supplied by Portugal. Two thousand volunteers of the most distinguished families in Spain, exclusive of the sailors and soldiers already mentioned, are stated to have accompanied the expedition.

Philip's preparations in the Netherlands of a further force were not less advanced than those of Spain. Besides a well-appointed army of 80,000 foot and 4000 horse, which the Duke of Parma had assembled in the neighbourhood of Nieuport and Dunkirk, that active general had provided a number of flat-bottomed vessels, fit for transporting both horse and foot, and had brought sailors to navigate them from the towns in the Baltic.

The details of the regular forces which the English assembled to oppose the Armada, both by sea and land, are minutely given in a manuscript now in the British Museum ("MS. Reg." 18 C. xxi.), formerly belonging to the Royal Library. At the time when Queen Elizabeth began her preparations, her fleet did not amount to more than thirty ships, none of them near equal in size to those of the enemy. Ultimately, however, the different descriptions of vessels, large and small, which formed her navy, amounted to 181 ships, manned by 17,472 sailors. The military force consisted of two armies, one for immediately opposing the enemy, under the Earl of Leicester; the other for the defence of the queen's person, commanded

by Lord Hunsdon. The army appointed for the defence of the queen's person amounted to 45,362, besides the band of pensioners, with thirty-six pieces of ordnance. Lord Leicester's army amounted to 18,419; the total of both armies to 63,511, besides 2000 foot who were expected from the Low Countries. The forces of the Presidency of the North remained stationary, in case anything should be attempted on the side of Scotland; as did also the forces of the Presidency of Wales.

The Armada set sail from Lisbon on the 29th May, 1588, but meeting with a storm was compelled to put in to Coruña for repairs, and did not finally leave Spain until 22nd July. On the 29th the fleet was observed entering the Channel, and the day following it was seen from Plymouth passing up in the form of a half-moon, having a distance of 7 miles between the extremities. The English fleet left Plymouth during the night, and avoiding a general engagement, followed in the rear of the Spaniards. The greater speed and lightness of the English ships, added to the skill and dexterity with which they were handled, enabled them to sink galleon after galleon of their heavy opponents; or, to use their own phrase, "to pluck the feathers of the Spaniard one by one." Quite demoralized, Medina Sidonia put into Calais roads. On the night of the 7th August the Spaniards, as they lay at Calais, were alarmed by the appearance of eight fire ships, sent with the tide into the midst of them by the English admiral, Lord Howard. In great confusion they cut their cables, and set out for the open sea, where they were promptly attacked by the English fleet, which inflicted a further loss of twelve ships, and about 4000 men. The Spanish admiral, the Duke of Medina Sidonia, then called a council of war, and though there still remained 120 ships, the disasters they had experienced had so dispirited their commander that they decided to endeavour to make their way back to Spain by the North Sea rather than attempt to pass back through the Channel in the face of the English fleet. They accordingly proceeded northward, followed for a time by the English ships; but when their pursuers were compelled by want of provisions and ammunition to return, the Spaniards found a more terrible enemy in the stormy weather that assailed them. A succession of fierce gales was encountered off the Scotch coast, and the whole fleet was dispersed. Horses, mules, and baggage were thrown overboard to lighten a few of the vessels. Some of the ships were dashed to pieces on the rocks of Norway; some sunk in the middle of the North Sea; others were thrown upon the coasts of Scotland and the Western Isles; and more than thirty were driven by another storm, which overtook them from the west, on different parts of the coast of Ireland. Of these, some afterwards reached home in the most shattered condition, under the vice-admiral Recado; others were shipwrecked among the rocks and shallows; and of those which reached the shore many of the crews were barbarously murdered, from an apprehension, it was pretended, that in a country where there were so many disaffected Catholics it would have been dangerous to show mercy to so great a number of the enemy. The Duke of Medina Sidonia having kept out in the open seas, escaped shipwreck; and, according to the official accounts, arrived at Santander, in the Bay of Biscay, about the end of September, "with noe more than sixty sayle oute of his whole fleete, and those verye much shattered."

A curious illustration of the different rate of transmission of intelligence in those days and ours is afforded by the fact that Elizabeth's spirited harangue to her army at Tilbury Fort was delivered three days *after* the Armada had been dispersed at Calais.

Strype, in his "Annals," reckons the Spanish loss upon the coast of England to have amounted to fifteen ships

and above 10,000 men, besides seventeen ships and 5394 men sunk, drowned, and taken upon the coast of Ireland. The statements, however, published at the time, apparently upon authority, say, "In July and August, ships fifteen, men 4701; sunk, &c., upon the coast of Ireland, seventeen ships, 5394 men," making a total of thirty-two ships, and 10,185 men.

(Camden's "History of Elizabeth;" Strype's "Annals of the Church;" Ellis' "Original Letters;" Watson's "History of Philip II.")

ARMADILLO is a family of *EDENTATA* exclusively confined to the New World. The armadillos are nearly all South American, inhabiting chiefly the forests of Brazil, and being rarely found west of the Andes. One species, however, is North American, and is found in South Texas. They are burrowing in their habits, and in this respect, as also in the possession of teeth, they differ from the anteaters of the same region. [See *ANT-EATER*.] Their food consists partly of vegetable matters, partly of insects and worms, and partly of carrion. The limbs are short and thick, with powerful claws; the body is depressed, broad, and stout, and covered above with plates and bands of bony armour; the head is broad between the eyes, but ends in a pointed muzzle, more or less prolonged; the eyes are small; the mouth is small. The teeth are thirty-two in number, eight on each side of the jaw; they are all alike, occupying the position of molars, and never found in front of the jaw. They are cylindrical, feeble, destitute of true roots, set apart from each other, and when the jaws are closed mutually fit into the respective intervals. The first teeth in all armadillos, with but one exception, remain all through life. As they are entirely destitute of enamel they are constantly wearing away and being renewed at the root. The tongue is slender, smooth, and extensible, and abundantly lubricated with a glutinous saliva; it is an organ both of touch and taste.

The armour or carapace which covers these animals consists of plates of true bone developed in the skin. There are three distinct portions, a large buckler over the shoulders, and a similar buckler over the haunches, while between these solid portions there intervenes a series of bands, overlapping each other's edges, and allowing to the body due freedom of motion. Each separate piece of mail consists of a multitude of small parts, all consolidated together, giving the idea of what is termed mosaic work, especially on the head and shoulders, the pattern differing in the various species. The limbs are almost entirely concealed by the lateral edges of this dorsal armour; they are covered by a hard coarse tuberculated skin. The head is also protected by armour. The canopus in some species is so loose that the animal can tuck his legs up between it and his body. The abdominal surface is not protected by armour, but covered by a tough coriaceous skin, more or less beset with long scattered coarse hairs; similar hairs spring from between the joints of the dorsal armour, and are most numerous in young individuals. In some species, however, as the *mataco* (*Tolypeutes apax*), in which the armour is thick and calcareous, no hair is to be seen.

The armadillos trust to their burrows for safety; but when surprised they roll themselves more or less completely into the form of a ball, much in the same manner as the hedgehog; the *Mataco*, indeed, which does not burrow, and is protected by a peculiarly solid coat of mail, can assume a completely globular figure, the head, limbs, and tail being quite concealed. Most of the species of armadillo are nocturnal, and remain concealed in their subterranean retreats during the day, from which they can only be forced out by smoke or water.

On level ground these animals, most of them at least, can trip along at a tolerably rapid pace. Their movements are singular, in consequence of their having no collar-bone,

and their limbs acting without any corresponding bendings of the vertebral column. See *ARM*.

The food of the armadillos consists of the roots of the manioc, maize, potatoes, and soft vegetables generally, together with insects, worms, small lizards, frogs, and, as D'Azara says, even small snakes. They are destructive to the eggs or young of birds which build their nests on the ground. They are fond of putrid animal substances, and are said occasionally to burrow into graves which are not properly secured.

With respect to the senses of these animals, those of smell and hearing are very acute; that of sight is more limited. None of the existing species attain to a large size, excepting one, namely, the *Priodontes gigas*, which is often 3 feet in length, exclusive of the tail.

According to Professor Flower the armadillos may be divided into six genera—1. *Tatusia* (French, *Tatu-armadillo*), which has on the fore limbs the two middle toes large, the two toes answering to the thumb and index finger small, and the fifth toe quite rudimentary. The ears are long, and are placed close together. 2. *Dasypus* (Gr. *dasur*, rough; *pous*, foot), which has short ears placed widely apart. The toes are five in number; the index toe is slender, the middle thick. 3. *Xenurus* (Gr. *xenos*, strange; *ouros*, tail). The tail, instead of being protected by armour, is covered with ordinary skin, on which a few hairs are found. 4. *Priodontes* (Gr. *prion*, saw; *odous*, tooth). The thumb and index toe are very long and slender, the middle one is very broad, the fourth small, the fifth smallest of all. The teeth are very numerous. 5. *Tolypeutes* (Gr. *tolypeus*, to roll up into a ball), which has only three toes, the first long and slender, the middle toe long and thick, the third small. 6. *Chlamyphorus* (Gr. *chlamus*, cloak; *pherō*, carry). The toes are four in number; the middle toes are slender, the first and fourth long and broad.

The following is some account of the most interesting species:—

The *Peba* (*Tatusia novemcincta*) extends from Brazil and Guiana through Central America as far north as Texas,

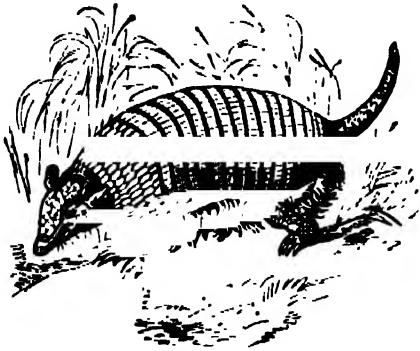


The Peba.

being the only North American species known. It is timid and nocturnal, frequenting open plains and cultivated fields, but never woods. It burrows with great rapidity, and is much hunted for the sake of its flesh. The muzzle is elongated and conical; the ears moderate and pointed; the tail long and ringed with armour. The length of head and body is 16 inches; that of the tail 14 inches. The carapace has nine intermediate bands, and is covered with a thin horny skin. Allied to the Peba is a species termed the mule armadillo. Mr. Darwin states that this species seems to prefer rocky and slightly undulating ground, and hence is common in Banda Oriental and Entre Rios. It differs from the Peba in being of smaller size, with a shorter

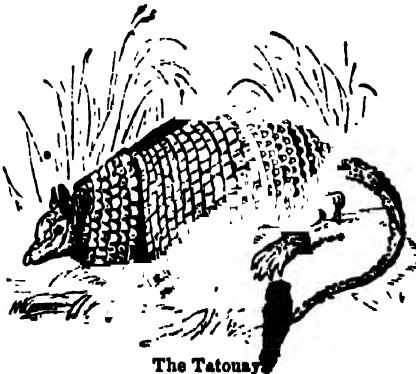
tail, and long upright ears. It is, moreover, diurnal in its habits, and does not burrow with such facility. (See Plate BRUTA.) The Matabo (*Tolypeutes apax*), or ball armadillo, has three very flexible bands, and has its plates of armour extremely hard and solid. The tail is very short; the ears are small. It has only three toes on its fore feet, on the tips of which it walks. In its habits it is diurnal, and not well adapted for burrowing; but it can roll itself up completely into a ball, and is safe in its tessellated shell; for "the dog," says Mr. Darwin, "not being able to take the whole in its mouth, tries to bite on one side, and the ball slips away." It is found in Brazil, Paraguay, and Buenos Ayres.

The Poyou (*Dasypus sexcinctus*) is found in Brazil, and is very common in Paraguay. It is quick in its movements, restless, confident, and inquisitive, and is said to look out



The Poyou.

of its burrow if it hears any unusual noise. It lives solitary or in pairs, in wooded districts, where it excavates deep burrows with astonishing celerity. Its voice is a low grunt, like that of a young pig. Melons, potatoes, and other vegetables, together with carrion, constitute its food. It has a habit of squatting on the ground and remaining for some time motionless. The head is large, flat, and nearly triangular; the snout short, the ears moderate. Several examples of this species have lived in the Zoological Gardens. They exhibited but little fear, and soon became familiar. When running about in their inclosure they would turn up the turf rapidly with their noses, as if in quest of worms or larvae, and thus spoiled its neat appearance.



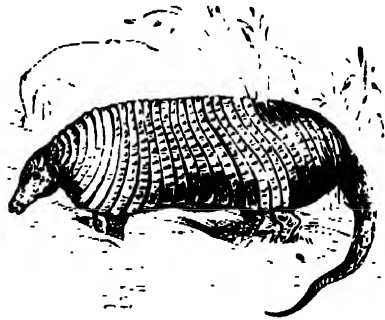
The Tatouay.

Their actions were quick, prompt, and sudden. Length of head and body, 16 inches; of tail, 6 or 8 inches. An allied species is the Pichy (*Dasypus minutus*). This animal, according to Mr. Darwin, is abundant on the arid plains near the Sierra Ventana, and likewise in the neighbourhood

of the Rio Negro. "At Bahia Blanca," he writes, "I found in the stomach of this armadillo coleoptera, larvae, roots of plants, and even a small snake of the genus *Amphisbæna*. During a morning's ride, three or four were generally met with; but in order to secure them it was necessary to jump off one's horse as quickly as possible, otherwise they would have disappeared by burrowing in the sandy soil. This species often endeavours to escape detection by squatting close to the ground and remaining motionless." Its flesh is very delicate. The pichy is about 10 inches in length, exclusive of the tail, which is $4\frac{1}{2}$ inches.

The Tatouay (*Xenurus tatouay*), distinguished by its naked tuberculous tail, is a native of Guiana, Brazil, Peru, Paraguay, and Surinam. The size and structure of its claws indicate its burrowing powers. It is about 1 foot 7 inches long, exclusive of the tail, which is somewhat more than 7 inches. The intermediate bands are twelve in number, and the compartments of these as well as of the bucklers are square.

The Great Armadillo (*Priodontes gigas*) is a large species inhabiting Brazil and the northern parts of Paraguay. It frequents the deep forests, where it excavates profound



The Great Armadillo.

burrows, from which it is not easily dislodged. This species measures nearly 3 feet from the nose to the root of the tail; the head is $7\frac{1}{2}$ inches long; the ears $1\frac{1}{2}$; the tail, which is 1 foot 5 inches long, is thick at the base and gradually tapers to a point; it is covered with overlapping scales; the intermediate bands are from twelve to thirteen in number. The teeth vary from twenty-two to twenty-five on each side of each jaw; they are flattened, and do not alternate one with another. The claws are enormous.

The *Chlamyphorus truncatus* is the smallest of all armadillos, being only about 6 inches in length. It is found only in the neighbourhood of Mendoza in the Argentine Confederation. The carapace is very loose, and the middle part of it is horny; it is attached to the internal skeleton at the back. The body is covered with long silky hair. It inhabits hot sandy plains, and burrows with extreme rapidity.

Closely allied to the armadillo is the Glyptodon, an extinct fossil animal found in South America in beds of the quaternary period. It was covered with a perfect coat of bony immoveable armour plates. It was considerably larger than any armadillo. The head was short, the feet short and broad, and the tail very long. The vertebral column was simply a cylindrical bony rod. The remains of some true species of *Dasypus* have also been found in South America.

ARMAGH, an inland county in the N.E. of Ireland, in the province of Ulster. It is bounded N. by Lough Neagh, E. by the county of Down, S. by the county of Louth, and W. by the counties of Monaghan and Tyrone. The greatest length from N. to S. is nearly 32 miles; the breadth, from E. to W. is about 20 miles. The area is 313,036 acres.

The surface is level in the N., then gradually hilly, but the hills are not high, except in the S.E., where they form a mountain group, of which Slieve-Gullion, the highest, is 1893 feet above the sea. These mountains are a continuation of the Mourne Mountains of the county of Down. Granite is their principal constituent. To the N. of this mountainous district a considerable tract extends from the county of Down on the one side to that of Monaghan on the other, in which granwacke and granwacke slate are the prevalent rocks; while red sandstone predominates in that part which lies along the margin of Lough Neagh, near which there are also extensive deposits of lignite. The mineral products are inconsiderable; lead has been found, but has not yielded profit. Limestone skirts the Callen and the Blackwater. Marble is quarried near Armagh.

The Callen, the chief river in the county, rises in the barony of Fews, and flows N. about 27 miles into the Blackwater. There are some small lakes, as Lough Chy, Lough Ross, and the Loughs of St. Patrick and St. Peter. The Newry Canal forms a considerable part of the eastern boundary of the county, separating it from the county of Down, and with the Ban affords water carriage from Lough Neagh to the Bay of Cullinstord; the Blackwater on the N.W. separates the county from Tyrone. The Ulster Canal, which commences near the mouth of the Blackwater, runs parallel with it for some distance, and proceeds by Monaghan and Clones to Upper Lough Erne, its total length being nearly 50 miles.

The medium temperature in the neighbourhood of the city of Armagh, distant about 32 miles from the Irish Sea, and elevated about 58 feet above the coast, is about 49° Fahr. There is less rainfall in Armagh than in other counties in Ireland.

The soil is generally fertile, except in the mountain district, and even there the land is cultivated to a considerable extent. In the neighbourhood of the chief town there are numerous inclosures and cultivated fields. In the northern part of the county, towards Lough Neagh, there are very extensive bogs, the soil of which is very black and deep; but many parts of them are now more or less under cultivation. The total area under cultivation in 1885 was 165,000 acres, the chief crops being—oats, 58,000 acres; potatoes, 28,000; flax, 16,000; and meadow and clover, 45,000. There were 77,000 cattle and 9000 sheep in the county at the same time. There are some dairies which produce butter for exportation. Apples are extensively cultivated in the N.E., and supply the markets of Belfast, Glasgow, and Liverpool. From the Armagh has gained the title of the orchard of Ireland. The productions of the lower classes are decidedly superior to those of the same class in most other parts of Ireland. They are usually well washed, well thatched, and have a clean and comfortable appearance.

Wool is the staple manufacture. Spinning machinery has been introduced to a considerable extent.

The county of Armagh is divided into eight baronies—Armagh, Lower Fews, Upper Fews, East O'Neilland, West O'Neilland, Lower Orior, Upper Orior, and Tullymore. Since the Redistribution Bill the county has returned three members to the House of Commons instead of two as formerly.

The population of Armagh in 1881 was 162,823—a decrease of 16,177 since 1871, and of over 70,000 from 1841. There were 75,137 Roman Catholics, 53,155 Protestant Episcopalians, 26,764 Presbyterians, and 4848 Methodists.

The principal towns are Armagh (the capital), Lurgan, Portadown, and part of Newry. Armagh, with Monaghan, Lough, and other districts, was formerly part of a territory known as Oriel or Ulster, which was frequently invaded by the Danes. Cairns, tumuli, and other antiquities have been found. The county was named after the chief city by Sir John Perrot in 1590.

ARMAGH, the capital, and both a Roman Catholic and Protestant archbishopric, is situated in the northern part of the county, near the little river Callen, an affluent of the Blackwater, 82 miles N.W. of Dublin by road, and 64 by rail.

The city stands on an eminence (hence its name *Ard-macha*, "Macha's Height"), with the cathedral in the centre crowning the summit. Tradition states that it was founded by "Macha of the golden hair," in the third century n.c. It was the metropolis of Ireland from 495 to the ninth century, and its college had a very high repute. Armagh, which had sunk greatly to decay, owes much of its renovation to the munificence and public spirit of Dr. Richard Robinson, Baron Rokeby, who was archbishop from 1765 to 1794. The cathedral, after undergoing many changes from the period when St. Patrick is said to have founded it (in 445), was destroyed in 1566 by Shane O'Neil, rebuilt in 1616 by Primate Hampton, and again destroyed in 1642 by Sir Phelim O'Neil. It was once more rebuilt by Archbishop Margetson in the year 1675, repaired and improved by Archbishop Robinson, and completely restored by Archbishop Beresford. It is composed of red sandstone, and is built in the form of a cross 183 feet long, and 119 feet in breadth from end to end of the transepts, from the intersection of which rises a square tower 31 feet above the roof. A handsome Roman Catholic cathedral was built in 1873.

Archbishop Robinson built the archiepiscopal palace, adjoining the city, in the midst of a lawn skirted by plantations. An observatory was endowed and founded by the same primate in 1791. He died, however, before it was finished, and it was neglected till a succeeding primate, Lord John George Beresford, completed and indeed surpassed the original design. It is famous for its contributions to the annals of scientific research. Archbishop Robinson also founded and endowed the public library, which now contains upwards of 20,000 volumes. He died in October, 1794, at Clifton, near Bristol, but his body was taken to Armagh and interred in a vault under the cathedral.

About 2 miles W. of the city is an elliptical entrenchment, known as the Navan Fort, which covers a space of 12 acres, and is said to have been the seat of the Ulster sovereignty for 600 years. Emania, who founded a palace at Armagh three centuries before the Christian era, is the only queen who ever ruled in Ireland. She was slain in battle, and buried here. Adjoining the town is Gosford Castle, the seat of the Earl of Gosford; while S. of it stands Market Hill, surmounted by a cairn.

Armagh contains a court-house, county gaol, market house, linen-hall, infantry barracks, district lunatic asylum, various hospitals and charitable establishments, churches, chapels, schools, and municipal buildings suitable to a large county town. The town is exceedingly well built, and neat and orderly in appearance. The streets are flagged with marble, and the modern houses are constructed of the same material.

The population of Armagh in 1881 was 8797. The city had two representatives in the Irish Parliament, and returned one to the Imperial Parliament until 1885, when by the Redistribution Bill it ceased to have separate representation.

The principal business arises from the retail trade for the supply of the populous surrounding district, and the weekly market, where a good deal of agricultural produce is sold, as well as the linen made in the neighbourhood. Some linen weaving is carried on. The town is connected by railway with Belfast, Newry, Warrenpoint, &c.

Notwithstanding the disestablishment of the Irish Church the Archbishop of Armagh is still recognized by his title of "Lord Primate and Metropolitan of all Ireland." Although the centre of the Protestant religion in Ireland, the Roman Catholics in Armagh are numerous.

ARMAGNAC (*Armagnacum*), formerly a province of France which formed part of the territory of Gascony, and

which now forms the department of GERS. Auch was its capital. The country of Armagnac is high and hilly; it is fertile in corn, but more especially in wine, from which a large quantity of excellent brandy is distilled.

ARMAGNAC, COUNTS OF, a powerful family of Gascony, who were said to be descended from Clovis, and who exercised, during the fourteenth and fifteenth centuries, considerable influence over the destinies of France. The most important members of the family were John I. (died 1373), John III. (died 1391), Bernard VII. (died 1418), and John V. (died 1478).

The first of these, John I., increased the importance of his family by marrying a daughter of the house of Bourbon. He took an active part in the wars against the English under our Edward III., and was made governor of Languedoc by the French king. His grandson, John III., married the heiress of the house of Comminges, and took the title of that county. He led an army of adventurers into Italy, and was killed while laying siege to Alessandria (1391). He was succeeded by his brother Bernard VII., who became the head of the Orleans party, and the chief opponent of the house of Burgundy. Henry V.'s invasion found him in the south, but after the battle of Agincourt he hurried northwards to defend the capital, and was created Constable of France (1415). His rule was of great severity, and filled the country with terror. He was suspected of having hastened the death of the dauphin, and when the city surrendered to the Duke of Burgundy, who was now in alliance with the English, and the Constable was taken prisoner, the people of Paris broke into the prison where he had been thrown, killed him, and mutilated his body in mockery. John V., the grandson of Bernard, less powerful as a party chief, was even more notorious for his crimes and turbulence. His private life was most impure, and drew on him the Papal excommunication and exile. He was restored to his dignities by the new king, Louis XI., but was soon again in revolt. In vain did Louis endeavour to purchase the cessation of his enmity by the payment of the sum of 10,000 crowns. The count took the money, and then refused to disband his army. He still defied the royal troops, when Cardinal d'Alibi (called the "Devil of Arras") was sent to negotiate with him. The cardinal offered very favourable terms, and while the count was in the act of signing the proposed treaty the soldiers of the king rushed into the castle and massacred him and his followers. The house finally became extinct in 1503.

ARMAMENT, the name given to a naval or military force equipped for war. It is also used to designate the guns and other instruments of warfare with which a ship or an army is provided.

ARMA TOLI, a sort of national militia among the Greeks, instituted after the Turkish conquest about 1500. They were originally the Klephts, the unconquered mountaineers of northern Greece. They ever retained a sort of rude independence, sometimes paying a small tribute to the sultans, and being trusted by them with the suppression of brigandage in the mountain passes. The chiefs were styled Capitani or Polemarchs, and the general body, which was unlimited, Palikari. The office was hereditary.

The famous ALI PASHA of Janina, appointed to the care of the passes in 1788, made strenuous efforts to destroy their independence; but his cruelties drove the greater part to rebellion, and they fled to their native fastnesses in Mounts Olympus and Pindus, whence, at the first cry of the revolution, they issued forth to assist in the liberation of their country. This was in 1821. (Emerson's "Modern Greece;" Leake's "Morea," ii. 106.)

ARMENIA. Taken in the widest sense of the expression, Armenia embraces the country reaching from the Caucasus in the N. to the mountains of Kurdistan in the

S., and from the Caspian Sea in the E. to some little distance within Asia Minor in the W. In classic times Armenia included the whole of the Van district southwards to the thirty-eighth parallel, and in 1881 Selan, a German traveller, determined the site of Tigranocerta, one of its many capitals, at the village of Tel Ermen, on the "Armenian Hill," a little to the south-west of Mardin, within the limits of Upper Mesopotamia. But all this region is now mainly occupied by the Kurds, some of whose tribes reach far southwards to the vilayet of Diarbekir, while others have encroached upon the Armenian district round about Ararat, and are found as far north as the forty-first parallel, about the head waters of the Kur. Many centuries ago Armenia formed an important and extensive country of Western Asia, was divided into fifteen provinces, and contained many flourishing cities, the remains of some of which still testify to their original magnificence. It is now, however, divided between Turkey, Russia, and Persia, and has no separate recognition by either of these countries under the name by which the country was originally known. Turkish Armenia is principally contained in the province of Erzeroum; the Persian share is absorbed in Azerbaijan; whilst the Russian portion is chiefly included in the government of Erivan. In the present article we need only notice a few of the main geographical features and history of Armenia, fuller details being given in separate articles.

The greater part of the country constitutes a table-land elevated some 7000 feet above the sea level, intersected by rapid streams, and with numerous ranges of mountains rising above it. Armenia belongs to the great plateau of Iran; its southern boundary, which rises like a wall above the lower level of Mesopotamia, is the Kurdistan range, which passes in a W.N.W. direction a little to the N. of Mosul, is cut by the deep bed of the Tigris at Jezirah, passes a little N. of Nisibin, and past Mardin to the point where the Euphrates traverses the great range of the Taurus.

The various ramifications of mountain chains, with their accumulations of snow, contain the sources of innumerable streams. The Tigris has its origin in the Niphates. The Euphrates, and its first great auxiliary stream, the Murad-chai, also designated as the southern branch of the Euphrates, have their sources in the centre of Armenia. The Murad-chai flows in a western direction as long as it remains within the limits of Armenia. The Cyrus or Kur is the principal river of Armenia; but both the Choruk and the Araks (ancient *Araxes*) flow for some distance through Turkish Armenia before crossing the frontier on their course to the Euxine and the Caspian.

Among the lakes of Armenia that of Van is the most important. It lies in a basin surrounded by lofty hills on the S., W., and N., and is separated from the Lake of Urmia to the E. by a chain of hills. Its elevation is several thousand feet, and its circumference is about 240 miles. It contains two considerable islands, on which have been built Armenian convents. Eight small rivers fall into the lake, but none of them are of great importance.

Towards the north-east of Erivan is the Lake of Gonkeka or Sevan, also named Kiagar Kuni. From it springs the river Zengay or Zenghi, which passes by Erivan and then falls into the Araxes.

In the Masis or Mosian Hills, west of Mount Ararat, and at a distance of 27 miles towards the south from Karakulla on the Araxes, there is a lake of 24 miles in circumference, at the extraordinary elevation of 6000 feet.

The climate of Armenia is, in the higher regions, extremely cold. The summits of several of its mountains are covered with perpetual snow, and the sufferings of the Ten Thousand Greeks from the rigorous temperature are well known to the readers of Xenophon. The hills between

Trebizond and Erzeroum are sometimes covered with deep snow in the month of June, and the wells near Erzeroum thinly frozen over during the night in July. The plains verging towards Azerbaijan and Persia are often scorched in summer with excessive heat, and require artificial irrigation for the purposes of agriculture.

The soil of Armenia exhibits in many places appearances of volcanic products. This is particularly remarked in the neighbourhood of Maku, situated in a narrow valley which extends from the Araxene plain near Ararat in the direction of the Lake Van; and also in the country around the Lake of Goukka.

The country produces abundance of excellent iron and copper, which are exported to Mosul. Mines of gold and silver exist near Kebban and Argana, in the two branches of the Taurus which inclose the valley of the Karpoot (anciently *Sophène*), through which the Euphrates passes in its way from Armenia to Syria; rock-salt abounds in the valley of Kulpa, which slopes towards the Araxes, 4 miles below the fortress of Koor Ongley. A range of hills bordering the valley on the east side is apparently entirely composed of that mineral, and in the sides of these numerous excavations have been made.

The valleys of Armenia are fertile in grain, tobacco, madder, hemp, cotton, and in fruit trees, particularly a large description of apple, and walnuts. The excellence of the Armenian cotton was noticed by Marco Polo. Much of the country abounds in romantic scenery and luxuriant pasture, the district of Ararat being especially celebrated for these features.

The name of the ancient capital of Armenia was Artaxata, or Artaxistata. The modern site of the town is uncertain. Magnificent ruins still exist of the celebrated ancient town of Ani, about 4 miles west of the monastery of Kotehivan, in a plain, protected towards the S. and E. by a deep and impassable ravine through which the river Arpatchai runs. Erzeroum or Arzen al Rum (anciently *Garin*), and in Greek, *Theodotopolis* is the principal place of Turkish Armenia. See ERZEROUM.

The Armenian race, whose national name is Haik, Haik, or Hukun, formerly numbered some 8,000,000, but is now reduced to little over 2,000,000, distributed as under:—

Caucasian and Russian Empire . . .	850,000
Turkish Armenia	760,000
Turkey in Europe	250,000
Persian Armenia	150,000
Elsewhere	60,000

2,070,000

The centre of gravity of the Armenian nationality, which formerly lay about the basin of Lake Van, has been gradually shifted northwards to the neighbourhood of the Alagoz and famous monastery of Echmiadzin, both within the Russian frontier. The race, like the country itself, has long lost its political unity, and is now, as the above figures will show, distributed over the Russian, Turkish, and Persian empires. Nevertheless, over one-third of the population continue to reside under the Ottoman rule about the head-streams of the Euphrates and Aras. They are

features, dress, and social habits are by their distinct Christianity from the surrounding Kurdish and Turkish Mohammedans, with whom they cannot be said to enjoy much popularity. Their craft and acuteness have become proverbial; and although there may be some exaggeration in the charges brought against them, it cannot be denied that the criminal tone has been affected by the political servitude to which they have been long subjected. Like the Jews, the Armenians, after the loss of their independence, have turned to trade, which is now almost entirely their life. They accumulate all the

capital of the country, so that the money market is ruled by them. The great influence thus insured to them naturally causes mutual heartburnings and rivalries amongst themselves, while against the common enemy they combine together, and spare no sacrifice for the general weal. Surpassing others in shrewdness, the main object of the Armenian dealers is to purchase cheap wares of attractive appearance, and then retail them advantageously. They often succeed in amassing great wealth, which, however, they are always careful to conceal. Thus capital is hoarded up, and neither invested nor enjoyed.

Timid and taciturn, they display at least an outward obedience to their rulers, whom they invariably despise. Naturally of a mild disposition, they have scarcely ever sought to recover their independence by force of arms. Satisfied when allowed to pursue the peaceful paths of commerce, they have ever shown themselves submissive to their fierce and warlike neighbours. They might even be said, of all Christian people, to sympathize most with the Turks, whom they resemble in their earnest temper and frugal habits, and whose language they generally speak like a second mother-tongue. They have also some of the same social characteristics. Women among them are little better off than among the Moslems, being practically the drudges of the household. But while the sensual Turk often becomes the slave of his handmaiden, the Armenian man of business still remains the head of the family. All menial work is performed by the wife, who waits on her husband at his meals, which she never shares with him. Although unveiled indoors, she is never seen by strangers, even at entertainments, withdrawing to a room set apart for the purpose. This is usually raised a few feet above the large central hall, and shut off by means of a wooden lattice, whence, without being seen, the women command a view of the banquet below. Betrothed from her childhood by parental arrangement, a bride seldom obtains any sight of her future lord before their union.

The sufferings inflicted upon Armenians under the Turks during five centuries have not been less severe than those which befell their fellow-subjects in Bosnia and Bulgaria; but they were less known to the world, partly because their country lies far away out of the traveller's path, but especially because the Armenian, long trodden down, learned to look upon suffering as the badge of his race. The chief condition of the Anglo-Turkish Convention, signed 4th June, 1878, under which Great Britain bound herself to assist the Sultan in defending his territory in Armenia in the event of any future Russian invasion, was that various urgent reforms should be made in the administration of the country; but none of them have ever been carried out.

History of Armenia.—The Armenians call the progenitor of their nation and the first ruler of their country Haig or Haik, whose father they believed to have been Torgoma, the Thogarma of Scripture (Gen. x. 3), the son of Gomer and grandson of Japheth; his other sons being Ashkenaz and Riphath, both progenitors of northern tribes. The early history of Armenia is a confused mass of traditions, and the Armenians as a nation occupy no place in the early history of Asia. The country became partially subjected to the kings of Persia, and a body of Armenians formed part of the Persian army in the expedition of Xerxes against Greece in the year B.C. 480.

About the middle of the fourth century B.C. Vahey was upon the throne of the Haigs. He assisted Darius in his war with the Macedonians, but fell in battle in the year B.C. 328. Armenia became a Macedonian province, and the first governor appointed by Alexander the Great was Mithrines, a Persian. But in B.C. 317 the Armenian chief Ardward or Erward (Ardonates) headed a revolution against the reigning governor Neoptolemus, threw off the

Macedonian yoke, and maintained himself for thirty-three years as an independent sovereign. After his death the Armenians submitted to the supremacy of the Seleucidae, until two Armenian nobles, Artaxias and Zariadras, availed themselves of the moment when Antiochus the Great was defeated by the Romans (B.C. 190) to declare their country free from its allegiance to the Syrian kings. Armenia was at this epoch divided into two kingdoms—that of Armenia Minor on the western, and that of Armenia Major on the eastern side of the Euphrates. In Armenia Minor the descendants of Zariadras continued to rule till the fall of Mithridates; thenceforward the country became attached to one or the other of the neighbouring states, and in the reign of Vespasian was made a Roman province.

After having been for many years an object of contention between the Romans and the Parthians, Armenia was in A.D. 232 conquered by Ardeshir, first of the Sassanide kings of Persia, and the country remained subject to this dynasty till Dertad or Tiridates, the son of Khosro, and the only survivor of the Arsacide family, supported by a Roman army, made it free again. Early in the fourth century Tiridates and many of the Armenian nobility were converted to Christianity by St. Gregory, whom Pope Sylvester I. in A.D. 319, confirmed as pontiff of Armenia. The conversion of Constantine to the Christian faith occurred about the same time. This circumstance, while establishing friendly relations between the Greek empire and Armenia, exposed the latter country to the increased hatred of the heathen government of Persia. New disturbances ensued, till (A.D. 387) Theodosius the Great entered into a compact with the Persian king Sapor, by which the eastern part of Armenia was to belong to Persia, and the western part to the Roman empire.

After the fall of the Sassanide dynasty in 632, Armenia became the scene of conflict between the Greek and the rising Mohammedan empire. In 885, during the caliphate of Motawakkel, an Arabian army conquered Armenia. Many of the principal nobles were brought to Bagdad, where the greater number of them were forced to become converts to the Mohammedan religion. Not long afterwards the country became an object of contest between the Byzantine empire and the Seljuk Turks. Gagik, the last of the Bagratide kings, was treacherously killed (1079), and Armenia, though still partially governed by native princes, became mainly dependent on the Greek empire, while in the northern provinces the Turks, and in the southern parts the Kurds, encroached upon its limits.

From the year 1226 Georgia and Armenia suffered much from the incursions of the Mongols, which continued till near the end of the thirteenth century.

After the fall of the Bagratide dominion in Armenia proper, Rupen, a relative of the last king, fled with his family into Phrygia, and established an Armenian principality in the Taurus Mountains, north of Cilicia, which gradually extended its boundaries to the coast of the Mediterranean Sea. It soon derived importance from the services which its princes rendered to the monarchs of Europe during the crusades. Leon II., who reigned from 1185 till 1219, was in 1198 crowned king of Cilicia by Archbishop Conrad of Mainz, who was sent for that purpose by the German emperor, Henry VI., and Pope Celestine III.; and a crown was likewise presented to him by the Greek emperor Alexis. The Cilicio-Armenian kingdom continued till the latter part of the fourteenth century. The last king, Leon VI., was in 1375 taken prisoner by the Mamelukes of Egypt, and after a long captivity wandered as an exile through Europe, and died at Paris in 1393.

The Mamelukes were soon obliged to yield up their rule over Cilicia and part of Armenia proper to the Ottomans. The Armenians, now a nation without a country or home,

rather than endure cruel persecutions in the land of their fathers, spread themselves all over Asia and Europe. As early as the year 1331 Armenian refugees came to Kanenz in the Lausitz (Lusatia). Others followed the Ottoman conquerors to Constantinople (1453), where the grand seignior gave them a patriarch. They were well received in Russia, where numbers established themselves at New-Nakhechivan, on the Don, at Moscow, and at St. Petersburg. In 1605 12,000 families were led forcibly away from Armenia into Persia by the command of Shah Abbas. They settled at Julfa, one of the suburbs of Ispahan, giving to this quarter of the city the name of their city, Julfa, on the Araxes, in Armenia. Many who still remained at Tauriz, Erzeroum, Kars, and Bayazid subsequently withdrew to the Russian provinces south of the Caucasus. Armenian merchants are established in India, on the islands of the Eastern Archipelago, in Singapore, in Afghanistan, Persia, in every part of Asia Minor, in Syria and Egypt, and in nearly all the countries of Europe. Almost every important fair or mart, from Leipzig and London to Bombay and Calcutta, is visited by them. Originally a brave and warlike people, they have become distinguished for their peaceful character, and their submissiveness to the government of every country in which they live.

The *Armenian language* is overcharged with consonants. Besides many Indo-Germanic roots, it shows analogies to the Finnic dialects of Siberia and other languages of northern Asia. The grammar is excessively complicated: like the northern languages of Europe it has an article attached to the end of words. It does not distinguish the genders. The declension has ten cases in the singular and plural; and in its conjugation of the verbs we find a corresponding copiousness of inflections. The ancient or literary Armenian is so different in its grammar and structure from the present Armenian that it may be considered as a dead language. In good Armenian authors, of any age or country, no diversity of dialect is observable. The construction resembles that of the Greek language. Into the modern Armenian many foreign words have been introduced, especially from the Turkish; the grammar is altered, and the construction of sentences is modelled after the fashion of the Turkish language.

There has long existed at Venice a congregation of Armenian monks, who publish works on religion, theology, literature, and science. They dwell on the little island of San Lazaro, and call themselves Mekhitaristes, which name they derive from that of their founder, Peter Mekhitar, who fixed himself at Venice in 1717. The monks have a printing office well stocked with Armenian types, and have issued many important and rare works. Their editions are universally admitted to be the best and most correct.

ARMENIAN CHURCH. The Armenian Christians adopt the Apostolic, the Nicæan, and the Athanasian Creeds, but reject the decrees of the Council of Chalcedon, and follow the doctrines of Eutyches and of the Monophysites, in admitting but *one nature* in the person of Christ—that he is God only; this is, in the rite of their church, symbolically expressed by the use of red wine, unmixed with water, in the Lord's Supper. They assert that the Holy Ghost proceeds from the Father only. They have the seven sacraments of the Roman Catholic Church—Baptism, the Lord's Supper, Confirmation, Matrimony, Consecration of Priests, Confession of Sins, and Extreme Unction. They admit the doctrine of the transubstantiation of the bread and wine used in the Lord's Supper, which they administer under both forms to laymen as well as to ecclesiastics, though deviating from the rite adopted by other Christian sects, by dipping the bread into the wine. At baptism they sprinkle three times and as often dip, and confirmation is conjoined with it. Extreme unction is administered to ecclesiastics alone, and immediately after death, instead of

before, as in the Roman Catholic Church. The worship of saints is believed in, but not the doctrine of purgatory. There are more fasts than in the Greek Church, but fewer festivals. Divine service is often held at night. Mass is always celebrated in the old Armenian language, but preaching is carried on in the new. The head of the church, whose title is *Katholikos*, resides at Etschmiadzin, a monastery near Erivan, the capital of Russian Armenia, and to this place every Armenian is expected to make a pilgrimage once in his life.

The Armenian clergy are divided into monastics and seculars. The former (under which class are comprised patriarchs, archbishops, bishops, doctors, monks, and hermits) live in celibacy; the secular clergy, *i.e.* the officiating priests, are permitted and advised to marry once, but are not allowed to do so a second time. The Armenian Church does not acknowledge the supremacy of the pope.

ARMENTIÈRES, a town in France, in the department of Nord, on the river Lys, 9 miles by railway N.W. from Lille. It is a busy manufacturing place; the chief products are beet-root sugar, table linen, ticking, hosiery, lace, plaited articles, flaxen and cotton yarn, tulle, &c. The town is clean and well-built; it has an active commerce in its industrial products, and in corn, wine, brandy, &c. Population, 19,000.

ARMIN, ROBERT, a favourite comic actor and small author, was a contemporary of Shakspeare, and a member of the same company of players. Armin was a pupil of the famous actor Trollop, who died in 1588; he was in Scotland on one of the visits paid to that country by the English actors; he was one of the players licensed by King James on his accession to the English throne in 1603; and the latest publication that is certainly his appeared in 1609. In the first folio of Shakspeare he is named as one of the actors who had played in the great poet's dramas. His principal or only works were the following:—"The Italian Taylor and his Boy," 1609 (reprinted 1810); a novel of Straparola, rendered into doggerel English verse; *;&c.* "A Nest of Nunnies," 1608; "The History of the Two Maids of Moreclacke," a drama, printed in 1609.

ARMINIANS. See ARMINIUS, JACOBUS.

ARMINIUS, JACOBUS, the founder of the theological system called after him Arminianism, was born at Ouderwater (Old Water) on the Yssel, in South Holland, in 1560. His real name was James Hammenen, but following the custom of his day he Latinized it. His father, a centurion by trade, of whom he was but a child; but by the assistance of his friends, who had a high opinion of his abilities, he was educated first at Utrecht and Leyden, and afterwards at Geneva, where he received instruction from the celebrated Beza. Here he soon gave great offence by his enthusiastic defence of the philosophy of Peter Ramus, which was opposed to that of Aristotle, at that time regarded at Geneva as being beyond criticism. He was in consequence obliged to leave Geneva for Basle, where, his father having procured him, the university offered him the degree of doctor gratis, an honour which he declined on account of his youth. Here he studied under Grynaeus, and after a time returned to Amsterdam. In 1588 he was appointed minister of one of the churches there, in which office he continued with a gradually increasing reputation for the next fifteen years. During this time he was appointed to remodel the whole educational system of the town, a task he executed to the universal satisfaction. He was an eloquent preacher and a faithful pastor, and was distinguished both for his fidelity to duty and his knowledge of theology. His fame in the latter respect was so great, that he was solicited by some of the professors of the sciences to reply to the attack that had been made upon the dominant Calvinism by Richard Koorhert. He

undertook the task, and commenced a careful examination of the points in dispute, but soon found there was more in them for consideration than he had at first supposed. The more he thought upon the matter the more he became convinced that the views he had hitherto maintained were erroneous, and this change in his opinions soon began to appear in his sermons and expositions of the Scripture. His orthodoxy began to be suspected, but he was not fully drawn into public controversy until his appointment, in 1603, to the professorship of divinity at the University of Leyden. Here he had for a colleague Francis Gomarus, a fervid Calvinist, with whom Arminius soon came into open collision; and in 1604 there commenced a controversy between these two divines which aroused the most intense excitement, and ultimately divided the Protestant Church of the United Provinces. The dispute was waged with bitterness; and although in 1606 a general synod was convened to allay the strife, and in 1608 a public conference was held between Arminius and Gomarus, the conflict was still raging when Arminius died on the 19th October, 1609. His life had undoubtedly been shortened by the controversy in which he had been engaged, for though a brave and determined defender of what he felt to be the truth, he was of a mild and amiable disposition, and felt keenly the bitterness with which he had been assailed.

After his death his followers gained in strength and courage, and in 1610 they embodied their principles in a Remonstrance which they presented to the Conference of the states of the Hague the following year. The five points insisted on in this document are in substance as follows:—1. That God has made an eternal decree to bestow salvation on all who believe in Christ, and to inflict everlasting punishment on all who should refuse to do so. 2. That the atonement made by Christ is sufficient for all men, but its efficacy is only extended to those that believe. 3. That man being in a fallen state he cannot of his own will exercise saving faith, but needs the regenerating influence of the Holy Spirit. 4. That though all good in man proceeds from Divine grace, yet this grace may be resisted by the will of those who are impenitent. 5. That believers are able by the aid of the Holy Spirit to resist and conquer sin, but that the question as to whether they may fall from a state of grace and finally perish must await a further and fuller examination of the Scriptures. The latter point was soon afterwards decided in the affirmative.

The old Calvinist party in their turn set forth their views in a Counter-remonstrance, in which they asserted plainly the doctrine of absolute predestination and reprobation. The dispute soon merged into party politics; and several of the leading Arminians were put to death, while others were imprisoned.

The states-general ordered the whole controversy to be submitted to a national synod, which was held at Dort (1618-19), and which was attended by representatives from England, Scotland, the Netherlands, Hesse, Bremen, the Palatinate, and Switzerland. At this synod the doctrines of the counter-remonstrants were adopted and embodied, and the Arminians were found guilty of corrupting theology and holding pestilent errors. Some 300 Arminians were expelled from their pastorates, and all who would not submit were exiled. Under Frederick-Henry, however, the next stadtholder (1630) the exiles were recalled, and two years later they opened a college at Amsterdam, in which their system of theology was taught by Episcopius.

Thus established as a section of the Protestant Church in Holland, and their views of time have become much more liberal and ad-
hed. They now seek, by the rejection of creeds and insistence upon the necessity of

leading an upright and moral life, to unite Christians into one brotherhood notwithstanding differences of belief and modes of worship. Their numbers at the present time are very small, but their distinctive opinions are very widely spread among the members of other churches.

In England the Wesleyan Methodists and many of the Baptists hold Arminian views, which are also found even among the various Calvinistic churches and Roman Catholics. The works of Arminius were published in Latin in 1631, forming a single 4to volume. They were partly translated into English by James Nichols in 1825 and 1828, in two vols. 8vo.

AR'MISTICE, a mutual agreement to suspend hostilities between two armies or nations at war. It is generally proposed when an endeavour to form a treaty of peace is being made, and sometimes when both parties are exhausted. It is usually planned at a congress of representatives of the hostile powers, and during its operation they remain most strictly at peace, as in the case of the war between Germany and Denmark in 1864, in which an armistice was agreed on during the sitting of the London Congress. The desire of an armistice for a temporary purpose—such as to bury the dead after a battle—is indicated by the hoisting of a white flag.

ARMOR'ICA, ARMOR'ICÆ CIVITA'TES, the name given in the time of Cæsar to the maritime districts of Celtic Gaul, situated between the mouth of the Ligeris (Loire) and that of the Ségana (Seine); the word is derived from the Celtic *ar mor*, which means "near the sea." That tract of country was occupied by several tribes, the Veneti, Osismi, Coriosolites, Rhedones, Caletes, &c., who formed a sort of confederacy. They had a considerable fleet, with which they carried on trade with the opposite coast of Britain.

In the middle of the fifth century thousands of Britons, driven from their native country by the incursions of the Picts, crossed the Channel, and sought refuge in Armorica. Fresh immigrants continued to pour in from Britain, until the country began to be called Bretaine or Bretagne, and the people Bretons. The Council of Tours, held in 567, in one of its canons makes a distinction between the Breton and the Roman inhabitants of Armorica. The rulers were styled Counts of Bretagne. The country was finally subdued by Charlemagne, but the name of Armorica had long before this event been superseded by that of Bretagne.

AR'MOUR, is a general term for any defensive habit worn to protect the wearer from the attack of an enemy. *Harness* is a name formerly applied in this country to armour in the aggregate. In the sacred writings we find the shield, helmet, and breastplate mentioned at a very early period; and greaves, or armour for the legs, are named among the armour of Goliath. Homer mentions them, and his descriptions of the breastplate of Agamemnon, the shield of Achilles, and the golden armour of Glauens, indicate the highly-decorated character of much ancient armour. Among the more civilized ancient nations brass, iron, and other metals were used in its fabrication; but we also read of leathern armour, or possibly armour of skins only, as used by the Libyans and Persians; and among the Egyptians, according to Xenophon, metallic armour was confined to kings and nobles, while the common soldiery wore quilted linen for helmets, and carried large wooden shields. The same material was used occasionally for other pieces of armour, for Herodotus describes a breastplate of linen, on which figures of animals were woven, and which was ornamented with cotton thread and gold.

The complete Roman armour consisted of the helmet, shield, lorica, and greaves. The lorica was originally of leather, but in the time of Servius Tullius the whole of the Roman body armour was of brass. The Roman lorica was

frequently enriched on the abdomen with embossed figures, on the breast with a gorgon's head by way of amulet, on the shoulder plates with scrolls of thunderbolts, and on the leather border which covered the tops of the lambrequins (or pendant flaps) with lions' heads; and these were formed of the precious metals. Each Roman legion had its own device marked upon its shields. In the time of Trajan the lorica was shortened, being cut straight round above the hips. A bronze breast and back plate of this kind are preserved in the British Museum, upon the front of the former of which one of the paps of the breast still remains, like a high button, to which were fastened the shoulder plates which held the back and breast together.

The early Britons appear to have used no armour except the shield; but many of the Anglo-Saxons, according to Aeneas, a British bard, wore loricae of leather and four-cornered helmets, having probably derived them from the Romans. Hengist wore scale armour; but the Anglo-Saxon soldiers appear in drawings of the eighth century with no armour besides the shield and helmet, and armed with the sword and spear. Other armour was subsequently adopted, but its weight was found to be a great impediment to activity. Hence when Harold, in 1063, obtained immediate and decisive success over the Welsh, it was owing to the change of armour among his soldiers. He had observed that these mountaineers could not be pursued to their fastnesses by his troops when clad in ringed tunics, and he therefore commanded them, to use their ancient leather suits, which would not impede their activity.

The Dames, on their first appearance in England, seem to have had no armour beyond a broad collar or thorax of flat rings, and leather greaves, and other shin-pieces; but about the time of Canute they adopted, probably from the Normans, a tunic with a hood and long sleeves, and *chausses* or pantaloons, which covered the feet, all of these being coated with perforated lozenges of steel, called, from their resemblance to the meshes of a net, *mailes* or *masches*. They wore also a rounded conical helmet or skull-cap, with a round knob under which was painted the rays of a star on its apex; and a large broad nasal, to which the hood, being drawn up over the mouth, was attached, so as to leave nothing but the eyes exposed. The shield remained as before, and the weapons were spears, swords, and battle-axes or bipennes.

From the period of the Conquest seals (especially those of our kings) and monumental effigies furnish abundant evidence as to the changes which took place in the fashion of armour. The Conqueror himself appears on his seal in a hauberk apparently of rings set edgewise; and in the Bayeux tapestry ring armour forming both breeches and jacket is represented. This Sir S. Meyrick supposes to be the haubergeon, which is apparently distinct from the tunic or hauberk.

The *chapel de fer*, which resembles in shape a Tartar cap, being a cone which projects beyond the head, appears for the first time upon the seal of Rufus; and *regulated armour*, which consisted of little plates covering each other in the manner of tiles, and sewn upon a hauberk without sleeves or hood, appears during the reign of Stephen, towards the close of which the nasal of the helmet seems to have been disused. Henry II. is represented on his seal in a flat-ringed hauberk and a conical helmet without a nasal; but the flat rings gave way soon after the commencement of his reign, and the hauberk with rings set edgewise came into fashion. The shield also became shorter, and more angular on each side at the top. The second seal of Richard I. presents a cylindrical helmet, surmounted by his badge, the *Planta genista* or broom plant, and having an aventail or visor to protect the face. The great seal of John affords the first example of an English king wearing the surcoat, which is supposed to have originated with

the crusaders, for the double purpose of distinction and veiling the iron armour, which became very hot when exposed to the direct rays of the sun.

Pourpointerie or *pourpointing*, which consisted of padded work elaborately stitched, appears first in the great seals of Henry III., where the hauberk and chausses seem to be of this description. Some changes appear also in the helmet, which in his second seal is cylindrical, and has an aventail perforated for sight and breath, made to open and shut by hinges and a clasp. The knights or heavy cavalry of this period were wholly covered with mail, the face and left hand excepted. A manuscript of this reign represents knights in armour of gambesed or padded work, with surcoats and greaves or shin-pieces of steel. Armour of interlaced rings, which did not require to be sewn to an under garment, and was probably brought from the East by the crusaders, was introduced in the reign of Richard II.; in which also the *chanfron*, or armour of the horse's head, appears for the first time.

Considerable improvements were made in armour during the reigns of Edward I., II., and III. *Ailettes*, or shoulder-pieces, were introduced in that of Edward I., and in the following reign mixed armour, partly of plate and partly of mail, was in vogue. *Armures de fer* was a distinctive name applied to plate-armour, which was frequently decorated with such splendour as, by exciting the cupidity of enemies, to endanger the wearer. Froissart tells of a knight who, having been taken prisoner, was afterwards put to death for his beautiful armour. *Manelieres*, or pieces put upon the breast, and from which chains descended, one to the sword-belt and the other to the scabbard, appear about this time. It was customary in the time of Edward II. to wear the *colatise* or surcoat, ornamented with the warrior's arms, over the armour. One of the earliest examples of the *jousting-helmet*, surmounted by its crest, occurs in the monument of Sir Oliver Ingham, who died in 1313. Movable visors attached to the *bacinets*, or basin-shaped skull-caps, seem to have been introduced in the reign of Edward III.; and the monument of Humphrey de Bohun, earl of Hereford, of the date of 1367, presents the first specimen of plate armour with *taces*, or overlapping plates to cover the abdomen, which did not become general until the time of Henry V. Increased ornament was a characteristic of the armour of the reigns of Richard II. and Henry IV., about which time Italian armourers were much employed by the English nobility. Chain-mail appears to have been entirely disused soon after 1400; complete armour of plate, of which a fine specimen is afforded by the effigy of Richard Beauchamp, earl of Warwick, who died in 1330, superseding it. Black armour was often used at this period for mourning. Immense elbow-plates form a distinguishing feature in armour from the reign of Edward IV. to that of Henry VIII. Plate-armour attained its highest perfection about the reign of Richard III., and one of the finest suits preserved in the Tower of London, accompanied by a *chanfron*, *monafaire*, and *poitral*, for arming the horse, belonged to Henry VIII. In his reign fluted armour was occasionally used, a fashion which is supposed to have originated in Germany. The helmet assumed the form of the head, but presented a salient angle in front. The breastplate was globular, and lambays, or steel-plates to protect the thighs when on horseback, were adopted. A great deal of the armour of this period had devices, arms, &c., stamped or engraved upon it; and some was *damasquined*, or inlaid with gold. The alterations were chiefly those of ornament.

In the reign of Edward VI. a slight change took place in the form of the breastplate, which was again a little changed in the reign of Mary. During Elizabeth's reign no great alteration took place. But armour *cap-a-pie*, says Sir Samuel Meyrick, "began to fall into disrepute

soon after the accession of James I., and in the latter part of his reign the jamba, or steel coverings for the legs, were almost wholly laid aside."

For some considerable period previous to the time of James I. the passion for plate armour—which reached its highest development about the end of the fifteenth century—had been steadily declining. As the sixteenth century advanced the decadence of armour began to be evidenced by its assimilation to the forms of dress and prevailing fashions of the time. Mere surface ornamentation was more and more regarded; fluted, laminated, and puffed suits became fashionable, and the gradual disuse of armour was foreshadowed by the increasing use of fire-arms, against which it afforded no sufficient protection. The knights of the fifteenth century, and the armourers who accoutred them, did their best to make a stand against employing fire-arms in warfare, but the introduction of the musket may be said to have put the *coup de grâce* to armour and old-fashioned chivalry. King Charles I. is continually represented in armour; and he took great pains to bring about some uniformity in the fashion of armour among his officers and soldiers, but only as a matter of fashion. Soon after the rise of the Protectorate we find the helmet and cuirass only worn, except some armour to the knees, which continued for a short time. The cuirass and a kind of helmet are still retained in the royal regiments of Life Guards, and also in one or two similar regiments in the armies of France and Germany, but more for show than use.

Some remarks on the ancient mode of putting on armour, communicated to the Society of Antiquaries by Sir Samuel Meyrick, unravel, by the help of ancient documents, what was previously an enigma. The knight began with his feet and clothed upward—viz. 1, his sabatynes or steel clogs; 2, the greaves or shin-pieces; 3, the cuisses or thigh-pieces; 4, the breech of mail; 5, the *tailletes* or overlapping pieces below the waist; 6, the breastplate or cuirass; 7, the vambraces or covers for the arms; 8, the *rebraces* or *arrière-bras*, the covering for the remaining part of the arm to the shoulder; 9, the gauntlets; 10, then the dagger was hung; 11, the short sword; 12, the cloak or coat, which was worn over the armour; 13, the *bacinet*; 14, the long sword; 15, the pennoncel, held in the left hand; 16, the shield.

In each of the leading European capitals there are collections of armour and of arms, illustrating their progress from very early times. The best public collection on view in England is that in the Tower of London, consisting of no less than 6000 examples; while that of Llewelyn Meyrick, at Goodrich Court, is perhaps the best private collection in the world.

ARMOUR PLATES. In these modern days the coat of mail appears to have shifted from soldiers to ships, which are now, for defensive purposes, clad all over in numerous inches of solid "armour." This consisted, in the first instance, of a complete plating of iron $4\frac{1}{2}$ inches thick; and vessels so protected were regarded as invulnerable. Improvements in the manufacture of heavy guns, however, rendered it necessary to increase the thickness of ships' armour; and the duel between ordnance and armour plates went on until the latter consisted of 28 inches of iron backed by 12 inches of solid teak. The 81-ton gun, however, proved its ability to send a large projectile completely through this immense armament, and even 100-ton guns were constructed. It was at first, therefore, proposed to increase the iron to a solid yard in thickness, with a corresponding addition of the timber backing; but a vessel so terribly weighted would be seriously hampered by the mere burden of its own armour, to say nothing of the huge engines necessary to give speed to such a monster, the hundreds of tons of coal she must carry, her four guns

of 100 tons each, with their projectiles of nearly a ton weight apiece, and powder charges, each of which resembles a sack of potatoes.

The gunmakers were consequently scoring a victory, when steel came to the aid of armour, and it was found that the thickness of the latter might be considerably reduced, and yet defy the biggest gun. Sir Joseph Whitworth was amongst the first in the field in this emergency. He devised plates of mild steel sufficiently hard to break up and destroy any projectiles that might strike them, and yet so tough that they would not crack or splinter under the terrific blows. Sir Joseph had already manufactured the toughest known shell—that is, the shell that would go through the thickest armour uninjured, and explode on the other side; and his armour of “mild steel” was capable of breaking up his own shells. It was made up of a number of rings of compressed steel imbedded in material of so mild a nature that it would not crack. The expense of this sort of armour, however, was a very serious matter. Iron plates cost about £50 a ton, and as the Whitworth plate could not be produced for less than £200 a ton, it seemed that the richest nations could scarcely afford the luxury of an ironclad invulnerable to modern artillery.

More recently, a Sheffield firm produced compound plates of iron and steel, which, while lighter and cheaper than those wholly of steel, were of equal strength, and were in some respects superior for their purpose, the starting and splitting, to which steel seems liable on the impact of shot, being obviated by the compound plate. Great difficulty was at first experienced in forming an effectual weld of the two, the steel sometimes dropping off after a few shots. This was overcome by pouring the steel while molten upon the iron plate while the latter was at a red heat. The surface of the iron became partly fused, and the two plates became firmly and inseparably united by a zone of semi-steel. A plate 14 inches thick, formed of 9 inches iron and 5 inches steel, is found to have extraordinary resisting power. Shots which would go almost through 24-inch iron plates simply “splashed” upon the surface of the compound one. The very complete command, moreover, which it was possible to maintain over the manufacture of steel, so as to modify it to any tensile strength, enabled the Admiralty to adopt with safety armour-plates of less than 14 inches for many portions of the vessels now built. See NAVY.

It was only by numerous and costly experiments that this result was arrived at. In the preparation of the armour-plate the iron backing was at first 9 inches in thickness, upon which 5 inches of liquid steel, high in carbon, was poured, making a total of 14 inches. The compound plate was gradually rolled down to 9 inches—that is, 3½ inches of steel upon 5½ inches of iron—which, for experimental purposes, was its finished thickness and proportion of metals. When subjected to test by the 12-ton 9-inch gun, the steel surface was found to be so hard that a Palliser chilled shot was seen to splash upon its surface and to break up into innumerable fragments. In no case did a projectile succeed in working its way through the armour, but in every instance radial cracks were produced, extending sometimes beyond the steel face and reaching to the edge. These cracks were a manifest weakness in the otherwise formidable plate, but the genius of the manufacturers proved equal to the case. Another series of experiments took place with plates which, after rolling, were specially treated by some peculiar process for the purpose of giving extra toughness as well as hardness. The new plates were 11 inches thick, of which the steel face varied from 2½ to 3½ inches in depth. Each one was fired at three times with the 12-ton 9-inch gun, with charges of 50 lbs. pebble powder and Palliser chilled projectiles weighing 258 lbs., at a range of 30 feet. In the

case of the plate with a steel facing 3½ inches deep, three very fine hair cracks were produced by the first two shots fired. They were, however, of very limited extent, and stopped short at the iron. The effect of the third shot was most remarkable of all. In these experiments the molecules of the steel were set in violent commotion by the two first discharges, as was proved by the ringing of the metal, and as the plate had neither time to cool nor to arrive at a state of rest before the third blow was delivered, the final round invariably inflicted the greatest amount of harm, both by producing cracks itself and by extending and developing those made by the former blows. In the case in question, however, the third shot produced no cracks whatever, and left the face of the steel in precisely the condition it was left by the previous shot, with the exception of the exact indent made by the shot itself, which penetrated 5½ inches and rebounded. At the back of the plate three bulges, each ¾ of an inch high, showed the spots which the shot had struck; but beyond this no indications of damage were to be seen. Compound armour thus, while cheaper than that made entirely of steel, answers quite as effectively the great end of armour plates, viz. to prevent penetration by breaking up the shot upon impact and before it has, consequently, had time to complete its work upon the plate; and, by the superior toughness of the iron backing, to arrest the disintegration of the plate itself arising from frequently repeated blows.

ARMS, in a general sense, include all kinds of weapons, whether of offence or defence. The latter are treated of under ARMOUR, and of many of the former fuller details are given in such articles as GUN, SWORD, &c. The bow and arrow (treated of under ARCHERY) was among the earliest of offensive weapons, and the SLING (which is noticed in that article) perhaps comes next in point of antiquity. The principal arms of the Jews were swords, daggers, spears, javelins, bows, arrows, and slings; they also used axes and maces as weapons of war.

The earliest metallic weapons were, according to Homer and Hesiod, of copper, perhaps hardened with tin. The word is commonly translated brass, but the compound metal now known by that name can hardly be meant. Sharp stones were, however, much used in early times, as they still are among barbarous nations, instead of metal, especially for the heading of arrows; and spears headed with the horns of the *dorcus*, or antelope, are mentioned by Herodotus as used by the Ethiopians.

Among the Greeks the foot-soldiers were divided into *hoplitai*, who wore armour, and carried broad shields and long spears; *psilai*, the light troops, who wore no other armour than a helmet, and were armed with darts, bows and arrows, or slings; and *peltastai*, an intermediate kind of troops, who carried the *pelta*, or narrow-pointed shields, and spears. Greek spears were usually of ash, with a leaf-shaped head of metal, and armed at the butt with a pointed ferule, with which they were stuck into the ground. The Macedonians used a very long spear called *sarissa*, which was more than 20 feet in length.

Swords, spears, javelins, bows, and slings were the offensive arms of the Romans, whose infantry soldiers were divided into *hastati*, who fought with spears; *principes*, who led the van; *triarii*, the third line; *vulturni*, the light troops; *funditores*, the slingers; and *sagittarii*, the archers. Their cavalry used the javelin on horseback. The arrows of the *sagittarii* had not only their pikes barbed, but were furnished with little hooks just above, which easily entered the flesh, but tore it when an attempt was made to draw them out. What greatly contributed to render the Romans masters of the world was, that as they successively fought against all nations, they renounced their own arms and methods of fighting wherever they met with better.

The Saxons, previous to their arrival in Britain, besides

the buckler and dagger, used a sword bent in the manner of a scythe; but their descendants soon changed it for one that was long, straight, and broad, double-edged and pointed. The ordinary weapons of the Saxons, after their arrival in our island, for the infantry, were spears, axes, bows and arrows, clubs, and swords. The cavalry were more uniformly armed with long spears, which they carried in their right hands, and swords which hung by a belt on their left sides. The arms of the Normans differed little from those of the Saxons. Their spears or lances were usually made of some light, strong wood, pointed with steel, very sharp, and well tempered; to these, with the sword and hawk, they added the cross-bow. The Normans also appear to have introduced a kind of field artillery, consisting of instruments or machines from which darts and stones were thrown to a considerable distance; to which also they added arrows heaved with combustible matter for setting fire to towns and shipping. Our military weapons were probably little altered till the time of Edward I., when the English long-bow seems to have been adopted, and the use of which was carried to great perfection.

Gunpowder was invented in the thirteenth century, and the larger sort of fire-arms (see GUN) in the fourteenth. Portable or hand fire-arms were not used till a century later. They were, according to Bilius, an eye-witness, contrived in 1430 by the Languese, when besieged by the Florentines; and most of their subsequent improvements were also effected by Italians. The earliest known representations of hand fire-arms occur in an illuminated French translation of *Quintus Curtius*, written in 1468, and preserved among the Harney MSS. in the British Museum.

The collection of the fact that *phorce* (small-pots) had been used for casting the Greek fire, may have aided the invention of firearms. The Emperor Leo, in his "Tactics," speaks of the use of vessels employed in pursuit after a naval battle, of large copper tubes called *siphones*, through which fire was blown into the enemies' ships; and Anna Comnena mentions the use of similar tubes in land warfare.

In the following enumeration the principal varieties of portable fire-arms used since the invention of gunpowder, with their accompaniments, are included:—The *hand-cannon*, probably the earliest in date, was a simple tube fixed on a straight stock of wood, about 3 feet in length, and furnished with touch-hole, trunnions, and cascade, like a large cannon. To prevent the priming being blown away a small pan was subsequently applied on the right side in lieu of the ordinary touch-hole. The *hand-gun*, which was cast in brass, had a longer tube, a flat piece of brass turning on a pin to cover the priming pan, and a perforated piece fixed on the breech to assist the aim. This fire-arm was in use in England at least as early as 1446, and was used to great advantage in the defence of Constantinople in 1453. With the addition of a contrivance suggested by the trigger of the cross-bow, to convey the match, which had previously been held in the hand, with certainty to the priming, the hand-gun was converted into the *arquebus*, or, by corruption, *languebus*, which is mentioned as early as 1476. Like the hand-gun and hand-cannon, the arquebus was fired from the chest, so that the eye could with difficulty be brought near enough to the barrel to take aim. This was remedied in the *haquebut*, *hakbut*, *hagbut*, or *hagbutsh*, a fire-arm of German origin, in which the butt was hooked or bent so as to raise the barrel nearer the level of the eye. The *dominiqua* was a long pistol, about half the weight of the haquebut, with a butt curved almost into a semicircle. The *musquet* was a Spanish invention, and first used at the battle of Pavia. The first Spanish musquets had straight stocks, and the French curved ones, and they were so long and heavy that

a rest, or staff about as high as a man's shoulder, with a fork at the top to receive the barrel of the musquet, and a ferule at the bottom to stick it in the ground, was needed in firing it. In addition to the rest a lighted fuze was carried about all day in action. In and long after the time of Elizabeth, the musqueteer was so encumbered with his unwieldy weapon, his rest, his powder-flask, his touch-box, his leathern bag of bullets, his burning match, and the sword needful for his defence after firing, that it was long doubted whether the bow was not a preferable weapon to the musquet.

The *wheel-lock* or *rose-lock*, invented in Italy about the reign of Henry VIII., was an ingenious contrivance for supplanting the match-lock, in which a furrowed wheel of steel, set in motion by a spring which was previously wound up by a detached lever or spanner, produced sparks of fire by revolving in contact with a piece of sulphuret of iron, thence called *pyrites*, or fire-stone. Next in order of time we find the *carrier*, or *currier of war*, similar to the arquebus, but having a longer barrel; and in the time of Elizabeth the *snaphaunce*, a cheap substitute for the wheel-lock, became common. It derived its name from a set of marauders whom the Dutch styled *snaphauncs*, or "poultry-stealers," by whom it was contrived to obviate the inconvenience which arose from the use of the burning match, which pointed out their position at night; and in it a spark was obtained by striking a piece of flint in the cock against a piece of furrowed steel, in a similar way to the fire-lock, to which it was a near approach. The name of the *carabine*, or *carbine*, a short gun 3 or 3½ feet long, is derived from *carabain*, an arquebuser, and this is from the old French *calabrin*, a light-armed soldier who worked a *calabre*, or stone-throwing machine. The *fusil* (when it comes our fusileers or fusiliers) was invented in France in 1630, but does not appear in England until the time of Charles II. Though originally of the same length and calibre as the musquet, it was lighter, and had a wheel-lock. The *blunderbuss* (a corruption of the Dutch *donderbus*, or thundering gun) was shorter than the carbine, and had a wide barrel. It seems to have been derived from Holland, and was not much known before the time of Charles II. The *dragon* (which, according to the most probable conjecture, took its name from the troops called dragoons) resembled a small blunderbuss, with the muzzle ornamented with a dragon's head. The *hand-mortar*, for throwing *grenades*, which are said to have been first used in 1591, and from which grenadiers derive their name, appears, like the dragon, to have been fired from the shoulder. The *pistol* (which appropriated the name of a kind of dagger made in the same town) was invented at Pistoia, in Tuscany, by Camillo Vitelli, in the reign of Henry VIII. The German cavalry called *reiters*, or more properly *ritters*, gave such ascendancy to the pistol as to occasion in France, and subsequently in England, the disuse of lances. Horsemen armed with them were sometimes called pistoliers. The *fire-lock* or *flint-lock* was evidently suggested by the snaphaunce, originally with the French about 1635. Previous to its invention the term fire-lock was sometimes applied to the wheel-lock. It was not till quite the beginning of the eighteenth century that the flint-lock entirely superseded the old match-lock. The flint-lock musquet was the leading fire-arm of Charles I. and Cromwell; but even at that time match-locks were common, and the proportion of pikemen was large. The pike was a favourite weapon, and only yielded ultimately to the combined musquet and bayonet about the middle of the eighteenth century.

Among the various accessories to the earlier fire-arms was the *match-box*, which was a tube of tin or copper, pierced full of small holes, in which a burning match could be conveyed safely and secretly, and appears to have been invented by Prince Maurice. The *powder-horn* originally

opened at the smaller end, for the discharge of the powder, but was subsequently improved by closing the smaller end, and adding a tube at the other end to contain just powder enough for one charge. The more capacious *powder-flask* is of German origin, and was known in England as early as the reign of Henry VIII. The *touch-box*, a small flask for containing fine priming or serpentine powder, was introduced when the corning or granulation of gunpowder became usual, and it was discovered that different qualities of powder were advisable for the charge and the priming. *Bandoliers* were small cylindrical boxes of wood or tin, covered with leather, and suspended from a belt or band, each of which contained one charge of powder. These were introduced in the reign of Henry III. of France, but were superseded on the introduction of the far safer and more convenient contrivance now called the *cartridge*, which consisted of a charge compactly tied up in paper, with the ball attached to it at one end, and which is described, though not by name, in a work published in 1670. The *patron* was a small semicylindrical box for carrying pistol-cartridges.

The *swynes-feather* (i.e. hog's bristle), which seems to have been the original prototype of the bayonet, was a long taper blade, fixed in a handle and carried in a sheath, which was given to a musketeer to defend himself with after discharging his piece. By sticking the handle in the muzzle of his gun it constituted a very efficient weapon for acting against pikemen; to diminish his encumbrance, the swynes-feather and musket-rest were combined, the latter constituting the sheath of the former. This instrument, the name of which was corrupted into swan's-feather, was invented in the reign of James I. but laid aside when, towards the latter end of the civil war, the use of the musket-rest was abandoned. It then became the practice to stick a dagger by its handle into the muzzle of the piece after discharging, in which practice we have the origin of the *bayonet*, so called from having been first made at Bayonne. The French introduced bayonets in 1671, forming them with plain handles to fit into the muzzle of the gun; but subsequently (in 1689) two rings were added by which the bayonet was placed on the muzzle without interfering with the firing. This improvement, the invention of General Mackay, an English officer, was introduced into the French army by Vanban in 1703. By the English themselves it was not adopted until after the battle of Fontenoy (1745), where the advantages its use conferred on the French were only too painfully manifest, the Duke of Cumberland's army being defeated with the loss of 15,000 men. The English, indeed, appear to have been exceedingly backward in the adoption of new weapons, and much behind other nations in inventive ingenuity—Spain, Germany, and France each producing artificers superior to our own in the manufacture of arms. The practice of rifling barrels may be traced as far back as 1140, but at first the grooves were parallel and of equal pitch. In the seventeenth century several continental armaments were armed with rifled carbines, but England did not adopt them till the eighteenth century. Breech-loaders were actually made in the days of the bow; and Henri Quatre is said to have invented a patent of his own in this line, and to have armed some of his troops with it. But until cartridges came into use the use of these primitive breech-loaders was so uncertain and even dangerous, that they gained but little favour. Possibly there was much wisdom in hesitating to adopt such arms and breech-loaders, for it was only the perfecting of their mechanism, the improvements in the gunpowder and the cartridges, and above all the adoption of the system of firing by a fulminate, which have enabled them to be used with the precision, length of range, and rapidity of fire that form such striking features in the warfare of modern times.

Matchlock muskets were conspicuous in the earlier successes of Marlborough, but his later victories, and all those of Wellington, were won with flint-locks, which were not entirely abandoned by the British army until 1840. A Scottish clergyman, Alexander Forsyth, had in 1807 taken out a patent for a percussion gun, but it was not till 1820 it came into general use. The system of firing with a fulminate was followed by the invention of the needle-gun, the first model of which was constructed in 1827 by Jean Nicolas Dreyse, a native of Erfurt. The English, to whom the invention was first offered, fought through their Crimean campaign and Indian mutiny with the Enfield and Minie rifle—both fired with percussion caps—and were presently astonished by the performances of the needle-gun in the hands of the Prussians in 1864 and 1866. Then followed the adoption of rapid firing breech-loaders by England and all other nations, percussion-cap guns giving place to Sniders, Chassepots, Martini-Henrys, &c., the description of which, as also of the larger and heavier firearms, belongs to our article upon GUNS.

ARMY. The word *army* is from the French *armée*, "the armed," the "men in arms," which is what the English word means. An army is a body of troops distributed in divisions and regiments, each under its own commander, and having officers of various descriptions to attend to all that is necessary to make the troops effective when in action. The following article contains a sketch of the military forces of Great Britain from early times, together with some details of the present constitution of the British army. Particulars respecting foreign armies will be found under the heading of their respective countries. We may, however, here state in brief that the enormous armaments of the day constitute one of the chief evils of the age. Almost every one denounces them, yet so far from any steps being taken to provide a remedy, the tax imposed by the different war ministers of Europe steadily increases. The money required for military expenses might perhaps be paid with comparative equanimity, but the drain on the freedom and industry of nations is almost intolerable. In 1818 France had under arms 118,000 men. By 1832 the peace strength had swollen to 452,000, and in 1870 the number had grown on paper to 909,000, including 417,000 of the *Garde Mobile*. In Prussia, in order to evade the secret articles of a treaty signed in Paris, September 8, 1807, short service and reserves were instituted. By means of this device Prussia, which was restricted to an army of 42,000 men, was able in 1813 to place 316,000 men under arms, out of a population of 5,000,000, without counting officers. In 1859 the army numbered on a war footing 530,000 men. In that year the nominal annual contingent was raised from 40,000 to 63,000 men, and the war strength became 781,000. After 1866, several provinces having been annexed, the contingent was raised to 100,000 men, which gave a war effective of close on 1,000,000. On the reorganizations after the events of 1870-71 the contingent for the whole German empire became 143,000 men, and it is estimated that 2,800,000 men could be placed under arms; and France, it is to be observed, is clearly resolved to be not one whit behind its great rival. One of the principal results of the great struggle of 1870-71 was the spreading of a mania throughout Europe for army reorganization on German principles, and in the leading states new military laws were passed which largely augmented the various standing armies. During the Seven Years' War, Russia, Prussia, France, and the states which constitute the present kingdom of Italy, had under arms a total of 1,150,000 men. In 1827 the same territorial mass could produce 2,629,000 men. In 1882 these had increased to 7,800,000—figures which will become 11,000,000 when the new military laws have produced

their full effect. If Austria, Spain, Turkey, the minor continental states, and Great Britain, be included, European armies will in a very few years number about 13,000,000 men. The various European powers, with Great Britain, spend £120,000,000 annually on soldiers, independently of a cost of £30,000,000 for naval armaments.

ARMY AGENT. See AGENT, ARMY.

ARMY, BRITISH. Of the beginning of the military history of our island, as of the beginning of most histories, little is known with any certainty; nor could much interest attach to the composition of the tribal forces of Britain that resisted the landing of Cæsar. The earliest Roman invasion (55 B.C.) of Britain was merely a descent on an island inhabited by savages by a civilized army, the general of which undertook the expedition more as a reconnaissance than with a view to settlement. On his second expedition (54 B.C.) to Britain, Julius certainly fought some battles and collected tribute and booty, but the entire period of his stay, both occasions included, was not more than four months, and when he withdrew his legions Roman influence in Britain was entirely withdrawn with them. Cæsar tells us that the Druids, as priesthood, were "exempt from military service," but the details of this service are extremely meagre, as also are the references to the 4000 "charioteers" of Cassivelaunus, the leading prince who disputed the Roman advance.

During the Roman occupation of Britain, the armed defences of the country were simply the Roman legions. It would have been unwise and impolitic of the Roman leaders to have placed arms in the hands of the members of a conquered and subject race as a whole. This was clearly understood. Although the Britons were freely drafted into the legions, and as freely sent to perform military duty on the Danube or the Dardanelles, no native levies in any number were retained to do duty in their native land. The legions of Rome recruited from Spain, Gaul, or Hungary, garrisoned Britain, and protected the frontiers and fertile districts of the province from the occasional raids of the unsubdued Highlanders of Caledonia. When the Romans evacuated Britain the inhabitants of that portion of the island now known as England were almost utterly devoid of the military art, and fell ready victims to the wild but hardy Picts and Scots.

There was another people, of Teutonic race, who, even during the Roman occupation, had made occasional descents upon the eastern coast, and would probably have established themselves there in 367, but for the vigour and military energy of Theodosius. However this may be, it is certain that in something more than 100 years after the withdrawal of the Roman garrison, the Teutons, who had come from the banks of the Elbe, had conquered and occupied the greater part of Britain. At the end of the sixth century these "Angles" and "Saxons" held all the land except Cornwall, Devonshire, and Somerset, the land west of the Severn, Cumberland and the adjoining parts, and the country north of the Forth. Owing chiefly, however, to civil wars between the several kingdoms set up in the country, more than 300 years passed away before the Anglo-Saxons were fused as one people with the original natives, and before the supreme power became concentrated in the hands of the kings of Wessex.

From this period when England became one kingdom under Egbert, king of Wessex, in 827, the military history of England consists of one long struggle against the Danes. The Danish dynasty ruled from 1016 till 1042, and the chief military incident of this period was the foundation by Canute of the house-carls or body guard, formed of picked men, both Danes and Englishmen. This was the first ideal of a standing army ever raised in England, and the force endured till it was destroyed at the battle of Hastings.

How the military system of the English prior to the Norman conquest was perfected and developed, it is impossible now to trace. We know, however, that by the time of the Confessor every English freeman fit to bear arms, and not incapacitated by any bodily infirmity, was, in case of foreign invasion, internal insurrection, or other emergency, compelled to join the army. This was one of the three services comprised under the title of *trinoda necessitas*. The remaining two were contributing to, or working at, the construction and repair of fortresses and the improvement of highways and bridges. The early English, in forming their armies, obeyed the following regulations:—All men of each family capable of carrying arms were led into the field by the head of that family. Every ten families formed a *tything*, which was commanded by a *horsholder*, or, as he was styled in his military capacity, a *conductor*. Ten *tythings* constituted a *hundred*, which was commanded by an officer sometimes termed a *hundredary*. Several hundreds formed a *tything*. This name, though modified, is still extant in the word *riding*, for the *ridings* of Yorkshire are but corruptions of the old English *tything*. The *tything* was commanded by an officer termed the *tything man*, and the force of a whole county or shire was led by the *hertoch*—*dux*, or *duke*. In time of peace the *duke* was the highest officer of the English national force, but in time of war he was subject to the king, or to the *kyning's hold*, or king's lieutenant.

Every occupant of land was obliged to maintain armour and weapons in proportion to his land or possessions. These he was permitted neither to sell, lend, nor pledge, nor even to alienate from his heirs. In order to insure the capacity of all men to wield their weapons, there were stated periods of military exercise every year; and once in the year, usually in the spring, there was a general review of all arms and armour throughout each county.

The greater portion of the early English national force consisted of infantry. The only men who were mounted on horseback seem to have been the *thanes*, and a few men of high rank who kept horses. Even so late as the battle of Hastings there is no record of any cavalry being employed even as outposts or *vedettes* on the English side.

By the laws of King Edward the Confessor any man who deserted his lord or fellow-soldiers from cowardice, while under the command of the *hertoch* in any expedition by land or sea, forfeited both his life and property, and his lord might resume any lands he had formerly granted him. If any man lost his life fighting under his leader, all payments due for reliefs of his estates were remitted to his heirs.

The conquest of England by William the Conqueror did not alter the original military constitution of the kingdom so much as is generally supposed. We are told vaguely in most histories about the feudal system, feudal armies, and the service of vassals; but those who will take the time and trouble to go deeply into the old records will find that, from the time of the Confessor to the present day, the principle of the national force for the defence of the realm has continued the same. The general levy of freemen, which we have seen was recognized by the laws of the Confessor for the defence of the realm, is still represented, though in a much altered form, by the militia. This force, whatever it may have been called in different periods, has always been the constitutional defensive force of England. In the early English days it is seen as the assembly of *tythings* and *hundreds* under the Plantagenets and Tudors as the *posse comitatus* and under the house of Hanover as the militia. It does not matter whether it was officered and commanded by *tything men*, *hundredaries*, *sheriffs*, or *lords-lieutenant*; it has always existed in England, and till within quite modern times service in the militia was a compulsory part of the duty of every English freeman, the law having only been repealed in 1882.

In the early days of English history, after the Norman conquest, the militia or national force of England, although it never legally sunk into abeyance, was not the most important, nor indeed at all an important, part of the forces at the disposal of the crown. It was not natural that it should be so. The militia has in every age been an eminently national force, and till within almost the last century has been composed of the mass of the people. After the Norman conquest the mass of the people were, however, strongly opposed to the foreign invaders and adventurers from Normandy, who had conquered England and divided among them the lands and properties of the island. At that time, except among the clergy, land was almost the only property, and the men of England who had formerly been rich landowners were by the battle of Hastings reduced to penury and want, and oftentimes to serfdom. With the rich landowners their relations and dependents suffered. To all these classes, with want came naturally discontent, and to such a discontented people the Norman conqueror could not look for the safe defence of his newly-acquired possessions either from external or internal foes.

It was accordingly not so much by design as by force of circumstances that what is termed the feudal system was introduced into England. The same remark equally applies to all conquered countries. The Norman expedition to England was not an invasion by one irritated nation into the domains of another to seek revenge or satisfaction. It was pre-eminently a filibustering expedition. In it the chieftains, and indeed the people of Normandy, took but an insignificant part. The soldiers who followed William from the Seine across the Channel were widely recruited from the desperadoes and adventurers of Flanders, Germany, and France. Their object was plunder, their aim the exchange of penny for plenty. The skill of their leader, the courage of the troops, and the internal jealousies of Englishmen gave them the victory of Hastings; and with one pitched battle won, England fell almost without another blow into their hands.

The occupation of the country, the division of its land, and the appropriation of its revenues followed the battle of Hastings as a matter of course, and the subjection of the English nobility, not so immediately as is generally supposed, but gradually and surely. It was, however, requisite not only to occupy, but to preserve. The Norman adventurers, although largely recruited from beyond the Channel after fortune had declared in their favour, were but an insignificant minority in the face of the whole English people. The latter were disarmed, but the laws which rendered them liable for the defence of their country were not repealed; and though the national militia was suspended, it was not abolished. The national militia could not obviously be relied upon to defend the conquests of the invaders, either from other filibustering adventures or from insurrections on the part of their own countrymen. It was necessary to establish a guard and a garrison for the conquered possessions against either foreign or native assailants.

This and other causes led to the natural introduction of what is termed the feudal system into the country about the year 1086. A considerable change was then made in the military establishment of the nation. This alteration in the constitution was not, it is said, effected by the sole power of King William, but was adopted with the consent of the great council of the realm assembled at Sarum, where all the principal landholders surrendered their possessions to military services, became the king's vassals, and did homage and swore fealty to him as superior lord. As these landholders were naturally nearly all Norman occupants of lands sequestered from the English, the feudal system formed a garrison for the possession of the country against the disaffected natives.

By the feudal laws every tenant in capite—that is,

every person holding immediately from the king the quantity of land amounting to a knight's fee—was bound to hold himself in readiness with horse and arms to serve the king in his wars, either at home or abroad, at his own expense for a stated time, generally forty days in a year, which were reckoned from the time of joining the army. Persons holding more or less were bound to do duty in proportion to their tenures; thus, one possessed of half a fee did duty for twenty days. The lands of the church were not exempt, but the clergy were permitted to perform their war service by deputies. The service being accomplished the tenant was at liberty to return home; if he or his followers continued afterwards to serve the king they were paid for their services. As a tenant who held several knights' fees could not do the service of more than one in his person, he might discharge the others by able substitutes, or by two esquires in lieu of each knight.

Sometimes the king compounded with his tenants for particular services, and sometimes for those of the whole year, accepting in lieu thereof pecuniary payments, with which he hired stipendiary troops. This arrangement was soon found to be more convenient for both sides. The king could naturally rely little on a force which was liable to break up at the end of forty days. It would be impossible to venture to make a distant expedition with such a force, or even to enter upon any campaign which might be of long duration. Such a force was very good as a mere Norman garrison of conquered England, but was quite unfit for foreign war. For the holders of knights' fees it was no doubt often much more convenient to pay money than to be torn away from their homes and occupations. When personal attendance was found to be troublesome the tenants found means of compounding it; first by sending substitutes, and in process of time by paying a fine to the crown. These fines at last came to be levied by assessments, at so much every knight's fee, under the name of scutages, which appear to have been levied for the first time in the fifth year of Henry II., on account of his expedition to Toulouse, and were apparently mere arbitrary compositions as the king and the subject could agree. The levy of scutages was afterwards abused into a means of oppression, as they came to be imposed on the landholders, by royal authority only, whenever the kings went to war, for the payment of mercenary troops. It became a matter of national complaint, and King John was obliged to promise in his great charter that no scutage should be imposed without the consent of the common council of the realm. This guardianship of the purse by the great men and commons in Parliament was also afterwards provided for by a variety of statutes under Edward I. and his grandson.

Originally, before the system of pecuniary replacement was extensively adopted, the tenants in capite, in order to find substitutes for those fees for which they could not serve themselves, made under-grants to their dependents, liable to the same conditions as those on which they themselves held from the crown—namely, fealty and homage—and that their tenants should attend them at war, and serve for a stated time at their own expense, properly armed and mounted. These again had their under-tenants and vassals. Men-at-arms or knights were generally attended by their tenants and vassals, both on horseback and on foot; the latter served in the infantry as either bill-men or archers.

After the long struggle between the conquering French and the conquered English was terminated the whole nation was amalgamated, and it became again safe to intrust the home defence of the kingdom to a national force. Thus in the time of Edward I. we find measures taken for the efficiency and armament of the militia in the celebrated Statute of Winchester. By this law every one

possessed of lands to the yearly value of fifteen pounds and fifty marks of goods was forced to keep a haubergeon, an iron head-piece, a sword, knife, and horse. Those who had ten or under fifteen pounds in land and fifty marks had to keep the same, with the exception of the horse. Persons who had a hundred shillings yearly in land had to keep a doublet, a head-piece of iron, a sword, and a knife. Whoever had under forty shillings annual rent in land, a sword, bow and arrows, and a knife. Those who had less than twenty marks in chattels were to have swords, daggers, bows and arrows. A review of these arms was to be made twice a year by two constables out of every hundred, who were to report defaulters to the justices.

This statute was repealed in the first year of Queen Mary, and another enacted wherein armour and weapons of more modern date were inserted.

Besides the feudal forces and the posse comitatus there were in the English armies, and more especially in the first early days after the Conquest, stipendiary troops, both natives and foreigners, hired by the kings with the money paid by those who commuted their feudal services. These troops were, of course, permanently servicable as long as the king chose to pay them, and were peculiarly useful to guard the marches or frontiers of the kingdom, next to the Welsh or Scotch, which were liable to perpetual inroads. They consisted both of natives and foreigners. They were really freebooters, willing to take any side for pay. Such troops were employed by William Rufus, Stephen, Henry II., and John. The garrisons in Ireland were at first formed by those to whom land was granted in that island; but they were afterwards largely provided by stipendiary troops. Edward I. employed mercenary soldiers in his French wars, and from the time of Edward III. it became customary for our kings to engage with their subjects and other persons by indenture to furnish soldiers at certain wages. From that time most of the English armies consisted of stipendiary troops. Such was the army raised and commanded by the Bishop of Norwich (1382), and the army of Henry V. It must, however, be borne in mind that these stipendiary troops were only hired for particular objects or at particular times, and were not at all standing armies.

During the thirteenth century there occurred one of the most important events which ever took place in the military history of the world, viz. the invention of gunpowder. It was not commonly used till the fourteenth century, or even the beginning of the fifteenth, and its general adoption was extremely gradual. But from its earliest introduction it began to effect a great, though slow and gradual, change in the whole scheme and practice of war. To suit the altered circumstances, it was found advisable to train up bodies of men for the sole purpose of war, and to separate them as much as possible from those other employments in which formerly all soldiers were occasionally engaged. Thus standing armies arose, and in England soon after the invention of gunpowder the Tudors established their standing guards, the earliest indication of our present standing army, in the two bodies which still exist as the gentlemen-at-arms and the yeomen of the guard. Thus also the custom of employing mercenary troops was much developed.

The regular troops being always available and better disciplined, it naturally followed that the old militia fell somewhat into disrepute. For internal defence, however, it was by no means forgotten, and in the time of Queen Mary an Act was passed for the general armament of the kingdom. All persons having estates or goods were assessed in proportion down to those having goods to the amount of £10, who had to keep one long-bow, one sheaf of arrows, one steel cap, and one black bill. Others, with more ample means, had to keep from six to ten horses, and a portable armoury of mail and weapons for about forty

men. The justices were ordered from time to time to inspect the horses and armament ordered by this statute, so as to insure efficiency.

The apprehension of a Spanish invasion during the reign of Elizabeth was the occasion of showing definitely the numerical strength of the militia. A commission was issued in 1572, by which all men over sixteen, and not physically incapable, were obliged to be mustered and reviewed. From the whole population so collected as many men were taken as could be kept and furnished at the expense of each shire, and these were formed into bands and properly drilled. In each band of 100 every exertion was made to have forty harquebusiers and twenty archers. We thus now find the musquet and the bow arrayed side by side. These bands, regularly drilled, formed what may be termed the first line of national military defence. But those who were not formed into the bands were not released from service. They were exercised in the use of their arms, and held liable to be called up if required by the necessities of war.

The returns and musters in consequence of this commission issued by Elizabeth were as follow:—

England, { the whole men to be furnished }	87,281
North Wales,	21,061
South Wales,	21,311
Total,	132,689

Under the economical rule of James I., when soldiery were no longer used for the pious purposes of torturing heretics, and when there were no more "borders," since England and Scotland were united under one crown, it was considered unnecessary longer to maintain a general armament of the whole population, and the Statute of Queen Mary, before referred to, was repealed, the city of London alone being allowed to retain its trained bands and its artillery. The latter, in the fine regiment of the Honourable Artillery Company, still survives, and has thus a continuous history older than that of any regiment of the line.

The time was now, however, rapidly approaching when the flames of war were to be once more lit in England, and events were soon to happen which would exercise a strong and lasting influence upon the army in its relation to the people. Charles I. had reigned but one year when an army of 10,000 men, "raised by the press," as the Commons refused to grant supplies, was sent against Cadiz. This army, without encountering the enemy, succumbed in the wine cellars of that town, and became so insubordinate that it had to be re-embarked and brought home. In 1627 the expedition, which was so unfortunate, was sent against the Isle of Ré. It consisted of 7000 men. Those who were saved from annihilation were billeted on their return in various parts of England. Their conduct had much to do with the framing of the Petition of Right, which was based on the four grievances—exaction of money under various names of loans, suspension of the Habeas Corpus, billeting soldiers on private persons, and the exercise of martial law.

As the militia had fallen into great decay, nothing having stirred the national blood since the time of the Spanish Armada, some measures were taken to restore its efficiency, and the great struggle between Charles I. and the Parliament broke out, the question of its control. The King and Parliament both called out the militia, and lords-tenant of counties obeyed according as they fancied. The first day of war was on the side of the king, who tried to take the Hull, then the most important seaport by which troops could be brought from the Continent, and where arms for 30,000 men had been collected. The Parliament had placed in Hull about 800 of the

trained bands of Yorkshire, under Sir John Hotham, who refused to open the gates to the king. This opposition afforded the king the excuse of establishing a body-guard; and Sir Robert Strickland's regiment of trained bands, about 600 strong, was selected for that honour. At the same time a cavalry guard was formed of "such gentlemen as were willing to list themselves into a troop of horse, and the Prince of Wales was appointed their captain."

Open war now broke out between the King and Parliament. The Parliament enrolled an army under Essex of 24,000 infantry, 5000 cavalry, and 500 dragoons, besides a train of artillery and pioneers. In August, 1642, the king raised his standard at Nottingham. He was supported in the civil war by the most of the nobility and gentry, by the Church of England, and the Roman Catholics. On the other hand, the city of London, most of the great corporations, and the commercial portion of the community, upheld the Commons.

Into the details of the struggle we cannot enter, but merely point out the composition of the respective forces engaged, and the influence of the civil war upon English military organization. The principal supporters of the king were known as the Cavaliers, and were the latest relics in England of a feudal military organization. They consisted of country gentlemen and noblemen, each commanding a small troop of their own tenants, grooms, and gamekeepers. Though devoted to the crown, such bands could with difficulty be welded into one harmonious body, or instructed in the steady discipline which was necessary for military success. The various bands of Cavaliers differed from each other in armament, formation, and strength. Though devoted indirectly to the crown as a common object of veneration, each squadron or troop looked directly to its own immediate leader, whose wishes and directions were supreme. The leader of each band, his son, his brother, and a few of his upper servants, were mounted on horses and armed with as good an armament as the disused armour of the family hall would provide. The implements of the chase, the fowling piece, the pistol, were at their disposal. The lower menials who followed their masters into the field were usually devoid of defensive covering, had few offensive weapons, and were sometimes reduced to serving their sovereign with little more than a scythe blade lashed to a pole. It was dangerous for any commander to separate the men from their leaders; it was equally dangerous to allow an army to consist of mounted men and foot soldiers mingled at hap-hazard; and if the peculiar circumstances of a great portion of Charles' soldiery be considered, the wonder will be, not that they were dispersed after a long and obstinate struggle, but that they held together at all after the formation of the first Parliamentary battalions.

One military virtue the Cavaliers possessed in a degree that has been rarely equalled, never equalled by any soldiery before or since. Their courage, the offspring of loyalty and devotion to a cause which they believed to be the purest and holiest for which sword and spear could be drawn, impelled them to a temerity in battle that hardly escaped being rashness. Proud of their ancestry, their family, and their fame, the cavalier gentry looked upon haughty disdain on what appeared to them their low-born adversaries; and though to despise a foeman is in general a grievous fault, a lofty contempt for the enemy was one of the readiest incitements to battle among the ranks of the Cavaliers.

The Parliamentary armies were entirely different from the Cavaliers, except with regard to courage. Their battalions were chiefly the products of towns, and were often raised by these towns. It was easy to introduce into a freshly formed force such principles of military organization as the republican leaders had learned abroad, or had seen to be necessary from the study and experience of continental warfare.

The highest mechanical ability of the age was naturally concentrated in the more important towns; the most skilled workmanship was found there. The most expert smiths, the nicest craftsmen, were at the disposal of the Parliamentary leaders; and naturally, as soon as war was imminent, every forge glowed, every anvil rung, in preparation of armament for the battalions of burghers or apprentices, who were enrolled for the protection of their rights and liberties against, as they held, a grasping and an arbitrary despot. The discipline as well as the courage of the battalions of the Commonwealth, were stimulated by the most curious religious fervour that ever permeated any armed force. The emotional excitement of the Crusaders may have prompted their feats of arms, but did not often restrain their conduct. The soldiers enlisted in the cause of freedom have, if we study military history, been usually but mercenaries, and seldom free from the excesses and indulgences to which all men who carry their lives in their hands seem inevitably prone. But in the army of the Commonwealth the case was certainly different. Not only did a stern and fervid religious enthusiasm characterize the troops that fought under Cromwell, and a religious eloquence, burning with texts from the Old Testament, form the staple conversation of their camps, but the men exhibited a degree of discipline and moral self-restraint probably never known in a military force before. By such an army death, danger, fatigue, or hardship, were not encountered, as by most armies, as disagreeable necessities of military duty, of which the avoidance would be followed by a stern and relentless military punishment; but were sought for zealously as a species of martyrdom or penance, savoury to the cause of the Covenant. A rigorous discipline was regarded as merely a necessary means to attain the great end, the cause of religious triumph. Fatigue was looked upon in the same light.

Under all the circumstances it is scarcely surprising that the well-knit, homogeneous, and disciplined forces of the Parliamentarians ultimately triumphed over the worse disciplined and less organized squadrons of the Cavaliers. Then the reign of the Saints commenced, and for the first and last time within her history England was held subject by a military despotism. Generals and brigadiers ruled as governors of provinces and administrators of shires. The very head of the government was raised to that position, in the first place, in recognition of his soldier-like qualities. The whole administration of the country was regulated on military principles, and the orders of the central authority were carried out in a true spirit of military discipline. It may be difficult to dissociate from this period the remembrance of some degree of religious tyranny on the part of the Puritans, but with regard to the main features of Cromwell's military government, nearly all Englishmen of every creed or shade of political opinion were proud. England never stood so high in the eyes of foreign nations, till after the battle of Waterloo, as she did under the Protectorate. Cromwell, at the zenith of his career, may be regarded as the arbiter of Europe. His military capabilities may not have been equal to those of some contemporary continental captains; but the naval and military force at his disposal, the quality of his soldiery, the mechanical talent and appliances at his command, made the English flag respected and the English name feared from Holyrood to the Vatican, from the Tagus to the Danube.

But the fabric that Cromwell supported rested on his individual energy alone. On his death the natural reaction ensued. In a short time the Restoration was agreed upon. Charles II. returned with joyful greeting to England, and the last time that the army of the Commonwealth stood as a whole on parade together was when it was marshalled, sullen and lowering, on Blackheath, to witness the passage of the new king to the capital.

The king's ministers deemed it necessary as rapidly as possible to disband the Parliamentary army. A few troops of life guards, and a few regiments of horse and some battalions of foot, were rapidly enrolled, and these formed the nucleus of the present army of England. The troops were not, however, at that time regarded as forming a standing army, but were known as the "guards and garrisons." Apart from occupying the various fortified places, the duties of the military were chiefly to act as armed police, and to enforce the laws against dissenters—one of the few statutes which have ever expressly sanctioned the employment of the military in the discharge of civil duties having been that passed in the time of Charles II. for the suppression of conventicles.

The military forces were also employed in ordinary police duties—to apprehend highwaymen and thieves, to put down riots, to take up runaway seamen from ships, to pluck up and destroy all tobacco planted, to patrol the roads round the metropolis for thieves, and to furnish escorts for specie being sent to the fleet at Portsmouth. At the time of Charles' death the total force of guards and garrisons amounted to 16,500.

In this reign the purchase of commissions by officers was established; a warrant was issued for the regulation of prices to be paid, and the royal assent gave the system legality.

For poor soldiers, before this time, who were worn out in the service there were no pensions. They were thrown on the poor's rates. Chelsea Hospital was then founded as a refuge for aged and infirm soldiers, upon an estate vested in the crown. The cost of its erection and maintenance was defrayed by a poundage levied on the pay of every soldier—a system which was only abolished in 1847.

The ordnance department had existed before the time of Charles II.; but in 1669 a royal warrant was issued, by which the department was reorganized on a civil footing, and intrusted with the supply of stores to the army and navy. Transport was at this time provided by the impressment of carriages or ships, when required by the ordnance or the navy.

James II. was more persistent than his predecessor in attempts to increase the army—Monmouth's rebellion affording him a temporary excuse. James even proposed to Parliament to disband the militia, and in its place to augment further the standing army; and although the proposal was instantly rejected by the Commons, he continued to add to the army, and to billet them on the country, in defiance of the remonstrances of Parliament, till the Revolution deprived him of his throne and put an end to the contest.

It was now necessary for the statesmen of England to determine on what basis the standing army of the country was in future to be maintained. Two different kinds of armies had been tried—one an army entirely under Parliament, the other an army entirely under the crown. Both had failed. It was now required to solve the problem how the military force could be placed equally under both the Parliament and the crown. This was accomplished by defining certain fundamental principles with regard to the army by the Act of Settlement and the Bill of Rights, which latter statute provided that "the raising or keeping of a standing army within the kingdom, unless it be by the consent of Parliament, is against the law;" the pay of the army was, moreover, placed strictly under the control of the House of Commons.

James, however, was making efforts to recover his throne, and seeking aid from France; Ireland and Scotland were disaffected, civil war was imminent, foreign war certain; and William III. had only a few Dutch troops and the remains of James' army with which to meet the storm. Parliament therefore sanctioned a standing army, trusting to

the checks it had established. An incident which occurred brought about, in an unexpected manner, the completion of the regulations under which the British standing army exists to this day. A regiment which was favourably inclined to James, and which had in consequence been ordered for service abroad, mutinied at Ipswich, and marched north, declaring for James. It was presently surrounded and compelled to lay down its arms; but William found himself without legal power to deal with the mutineers. He therefore applied to Parliament, and in 1689 was passed the first Mutiny Act, which, after repeating the provisions regarding the army contained in the Bill of Rights, and declaring the illegality of martial law, gave power to the crown to deal with the offences of mutiny and desertion by courts-martial. The bill was limited to six months, but when this period expired it was renewed. Again and again it expired and was renewed. At last not a session passed without a Mutiny Act. The later Acts varied in many particulars from that which was first passed, but they were uniform in all their principal points; such as the dependence of a standing army on the consent of Parliament, and the subjection of military men to all the processes of ordinary law.

The first Act was confined, as we have said, to the punishment of mutiny and desertion. Previously, when there had been an army, considerable inconvenience was experienced through the want of some military code. As no distinction was recognized between military and civil crimes, a special commission of oyer and terminer had to be issued to try offences of mutiny and desertion. Even the most arbitrary of the Stuarts had to have recourse to the slow machinery of assizes and juries to prefer a capital charge of any sort against a soldier. This was a manifest hindrance to discipline, which the second section of the first Mutiny Act was directed to remedy by the establishment of courts-martial. These tribunals, though still "unknown to the law of the land," soon became recognized institutions; and in course of time the annual Mutiny Act became a general code of law, in which was defined all military offences of the most serious kind, and, as precisely as possible, nearly all those of minor importance.

The *Articles of War*, which were made by the crown as the head of the army, or by the commander-in-chief, corresponded in some cases to clauses in the Mutiny Act; others, though relating to subjects in the latter, defined the particulars of the crime and the punishment applicable to it with more precision; whilst some of the articles had no counterpart in the Mutiny Act. Military law thus became complicated, uncertain, and conflicting; "perplexing to lawyers, and unintelligible to soldiers;" and some provisions were unsuitable, unnecessary, and obsolete. Various legal minds endeavoured to produce a satisfactory, permanent substitute for the annual Mutiny Act; but the government took no notice of the matter until a small but active body of Irish military law officers discovered in 1878 that the passing of the Mutiny Act, which had usually been a mere form, afforded an excellent instrument of obstruction; and accordingly in 1879 the Army Discipline and Regulation Act was passed (22 & 23 Vict. c. 33), the provisions of which are contained in five parts and upwards of 180 sections. This is now the permanent authority on army discipline and regulation, and has rendered the former annual Mutiny Act a thing of the past. In order, however, to preserve the full control of Parliament over the army it is provided that the Act shall not remain in force except in pursuance of an annual Act passed specially for that purpose, and shall then continue in force only for such time and subject to such provisions as may be specified.

The number of men sanctioned to be retained during times of peace was, after the peace of Ryswick (1697), 7000 in England, 15,000 in the colonies, and 12,000 in

Ireland—the latter being maintained by Ireland. In 1711, during war, the army was swollen to 201,000, and reduced to the former numbers immediately after the peace of Utrecht (1713).

The following statement shows the fluctuations between that time and the present, the peace years showing the average peace strength, and the war years the maximum to which the forces were raised. It should be noted that the East India Company's white troops were in 1857 incorporated with the Queen's army, which since that year has included all British troops serving in India; also, that the several minor wars in Abyssinia, Ashantee, Afghanistan, South Africa, and Egypt of late years did not involve any actual enlargement of the army.

PEACE.		WAR.	
Year.	Numbers.	Year.	Numbers.
1793,	17,013	1745,	74,187
1822,	71,790	1761,	67,776
1845,	100,911	1777,	90,734
1857,	156,995	1812,	245,996
1866,	203,404	1856,	275,079
1881,	165,320	1858,	222,871

The facility with which the British army could be increased or reduced in former years was due in great measure to the enrolment of foreigners to fight under William III. and Marlborough. These could be rapidly obtained at the beginning of a war, and when hostilities had terminated there was not a large mass of soldiers either to keep in arms or absorb in the civil population. This difficulty had to be borne by the continental states of which they were subjects. The same system prevailed in the campaigns of Wellington, and was perpetuated, in the shape of a "foreign legion," even so recently as the time of the Crimean war. It would not again, however, be possible, owing to the more general adoption in foreign countries of the system of universal military service, which absorbs into their native army almost all men capable of bearing arms.

The enlistment of foreigners, however, was always for service abroad, the Act of Settlement forbidding the employment of alien troops within the kingdom; and from the period of the Revolution, when a standing army first received parliamentary sanction, the policy was to recruit it from the lowest, and to officer it from the highest class. The idea of a middle-class army never occurred to our practical ancestors. They defrayed the cost of each regiment by paying a stipulated sum to the commanding officer; and it became of course the interest of the latter, when he required recruits, to go for them to the cheapest labour market. The system was fraught with apparent advantages, though it was at the same time productive of great evils. It had the advantage of giving the colonel a distinct interest in the health of his men, and the economical administration of his regiment. It had the ill effect of tempting him to bribe the commissaries to pass a regiment as complete which was in other words, to obtain for him a regiment at its full strength, when he was paying the expense of maintaining a skeleton of war, however, when the waste of the ordinary mode of recruiting, even in peace, was insufficient for the purpose. In 1696, a curious pamphlet, to be for some time published, proposing to solve the question by an impression falling on "any sturdy or the like idle, unknown, suspect, or if there be none such, then on any one that has already been in a gaol, or before a justice for a disorderly life." The advice was to release from custody the army or the navy. Criminals were pardoned on a

similar condition in 1702, and the compulsory enrolment of persons with no visible means of maintenance was enforced in 1703. Similar provisions are traceable in the Statute Book during the greater portion of the last century; and even in the Peninsular War three new regiments were composed of convicts, and one of them, it is well known, achieved a distinction which won for it a high place in the history of the British army. In ordinary periods the recruits were enlisted for life, but the additional levies in times of war were made for two, three, or five years' service. Wyndham, in 1806, introduced a service of seven, ten, and twelve years for the infantry, cavalry, and artillery, carrying with it a right to a pension at its termination. The system provoked on financial grounds considerable opposition, and two years later Castlereagh practically terminated it by inducing the House to give the option of either limited or unlimited service to recruits; and a slight additional bounty generally caused the men to enlist for life. The system thus initiated by Castlereagh remained in force till 1829, when limited enlistments were wholly discontinued, till they were revived by the Limited Enlistment Act in 1847. That Act fixed all enlistments in the infantry for ten years, and all re-engagements for eleven years. Very little alteration was made in these regulations until the great reorganizations of 1871 and 1881, to which we shall presently refer.

From the end of the Napoleonic wars in 1815 to the Crimean War in 1854, nothing occurred to require the army being enlarged beyond the usual peace strength. The sudden summons to war found a state of unreadiness and disorganization utterly discreditable to everyone concerned. At the time of the Duke of Wellington's funeral there were not guns enough at Woolwich to fire the necessary salute. There were cavalry, infantry, artillery, and militia, all scattered about the country; but they were almost isolated units, and none of them knew their relation to the rest. In the absence of a real organization and harmony of the whole, the soldiers, guns, and regiments we possessed were no more an army than the colours on a painter's pallet are a picture. The force sent to the Crimea was an agglomeration of battalions, individually perhaps the finest in the world, but unused to work together, without trained staff, administrative departments, or army organization of any kind. They fought at the Alma and at Inkerman with all the splendid valour of old Peninsular days; but, during the winter before Sebastopol, succumbed under the hardships, privations, and sickness brought on by sheer mismanagement. The experience purchased at such terrible cost was not thrown away, for a comprehensive scheme of army reform was acknowledged by everyone to be an absolute and urgent necessity.

It was felt that one of the chief hindrances to this step was the existence of the system of purchase of commissions in the army. From the time it first commenced the mischievous tendency of the system was seen, and many attempts had been made to suppress it. Its supporters, however, mustered very strong, and were backed by high authorities such as Lord Melbourne, the Duke of Wellington, Lord Raglan, Lord Pannure, and others. The facts remained that the system introduced officers into the army by pecuniary means rather than military fitness; and that, having bought their position, the officers regarded themselves as installed in a freehold with which reforms would seriously interfere, and they therefore became the jealous and determined opponents of all change whatever. The system was acknowledged to be a hopeless obstruction, to be removed at all cost; and in 1871, when the House of Lords refused to pass the Army Regulation Bill—already passed by the Commons, and one object of which was the entire abolition of the purchase system—Mr. Gladstone obtained a royal warrant from the queen, effecting this

object from 1st November, 1871. It was at the same time undertaken that the officers should be duly compensated for the amounts they had expended; but the step taken by the prime minister was regarded by many, even of his own supporters, as an unjustifiable interference with the rights of parliament—it having been forgotten that the legality of the system rested, not on any legislative enactment, but upon a warrant of King James II.

• A number of anomalous and often conflicting departmental authorities, and a dual system on which the army was governed, had also to be swept away. The militia had, till a few years before, been under the Home Office, and the commissariat department was located at the Treasury. The "secretary of state for war and colonies" had a vague sort of control, limited to time of war; while the "secretary at war" was parliamentary representative of the army, and exercised a certain financial control from which the ordnance department was excepted. The master general and board of ordnance were responsible for the supply of material on requisition, but were otherwise quite independent, and had the artillery and engineers under them. The commander-in-chief was responsible to the sovereign alone in all matters connected with the command, discipline, and patronage of the army, but to the secretary at war in financial matters; and out of this dual government by Home Guards and War Office, there arose endless complications. The condition arose out of a tradition, of estimate validity, that the army was governed by royal prerogative. The queen, however, in 1870, gave substantial proof of her willingness to make some sacrifice in the cause of army reform, by signing an order in council in which she surrendered her prerogative in the matter, and the general commanding in chief was formally declared to be subordinate to the minister of war. The control of the colonies had some years previously been separated from the War Office, and under this latter department the entire oversight of all army concerns was gradually placed, so that unity of administration might at any rate be insured.

Purchase having been abolished, and an efficient unity of control provided, the government proceeded to lay down a new code of regulations, under which, from 1871, the British army may be said to have started afresh upon an entirely new system. This system was intended to provide, as a matter of the first importance, that the army should be a service open to merit and military enterprise, in whatever class there might be found, and that no arbitrary restrictions of rank or wealth should limit the career of a soldier. The principal opening to the career of an officer is now through competitive examination, as in the old service, special facilities being offered to university students who have taken the B.A. degree; to officers from the militia; to the sons of distinguished soldiers; and, lastly, to the private soldier who exhibits a capacity for command. Advancement to the higher grades in the army is by seniority, tempered by selection; efficient safeguards being taken against the revival of purchase in any form. Very judicious measures have also been adopted to regulate the necessary expenditure of officers, so that the costliness of the position need no longer be a hindrance to its attainment.

Further changes were necessary to insure a more rapid flow of promotion, and the formation of effective reserves; and it was consequently necessary to establish some sort of connection between regular, militia, and volunteers, so that any one of them, at any time, might at once know to what he was entitled, and what his duties were.

A new career-table passed under which an infantry officer might select either "long service" or "short service." As regards the "long service," he might continue to live years in the regular army, at the end of which, if he had enlisted himself well and was allowed

by his commanding officer, he might re-engage for nine years more to complete a service of twenty-one years. On his discharge, after completing the twenty-one years, he would receive a pension for life. As regards "short service," a recruit might enlist for six years in the regular army, and six years in the reserve. After the first six years he would be able to return to civil life, to live wherever he liked within the United Kingdom, to follow any trade or occupation he pleased, and to receive a pension of 4*d.* a day for the other six years, in return for which he would be liable to be drilled occasionally, and to be called out in time of war or threatened war.

The first few years' experience of the new system amply proved the wisdom of the change. Whereas under the old system of long service sufficient recruits were never forthcoming, the short service enlistments raised the number from 12,000 to from 25,000 to 29,000 annually. So plentiful indeed was the supply of recruits that in 1881 the war minister felt himself justified in raising the standard of age from eighteen to nineteen, and for the present all enlistments are for short service, except in the following cases, in which the enlistment is for the full period of twelve years with the colours, viz. men enlisted for the Household Cavalry, the band of the Royal Military College, Ordnance Artificers, and boys for musicians. In view, moreover, of the necessary service abroad, it was deemed advisable to raise the period of service with the colours from six to seven years, to eight years in the event of being abroad, and to nine in case of war, the total period of service remaining the same, viz. twelve years. A second line of reserve, however, was formed, by 10,000 of the most eligible men who had completed their time in the first reserve being allowed to prolong their liability for a further term of four years. Provision is thus made for the army reserve numbering some 60,000 trained and seasoned soldiers capable of at once taking their place in the ranks of the regular forces. There is thus a powerful addition available for the army in the event of a great war; and as a provision not only for contests of magnitude, but for those minor sudden emergencies which occur but too frequently, it is arranged that we shall always have one army corps in a state of efficiency and ready for immediate embarkation. In the Army Act of 1881 power was given to the government, in mobilizing the reserves, to call them out either by regiments, or by length of service with the colours, or by any other classification which circumstances might render desirable. On the occasion of the war in Egypt, in 1882, it was decided to call up all reserve men who had left the colours since the 1st of January, 1881. The number of men thus summoned was 11,650. Of these 11,030 answered the call and reported themselves at their depots.

A further change was carried out which, as it probably did more violence to old feelings and traditions than any other, caused the most opposition than any of the other proposals. Artillery regiments had long been known under a definite *territorial* name, with which was associated its special history, glorious deeds. But to carry out the government's plan of reorganizing and consolidating the forces, it was necessary to sacrifice all distinctive numbers and names. The *infantry* of the line was reconstituted upon one unit of organization, viz., the regiment of two battalions, with one abroad and one at home, consisting together of from 1,000 to 1,800 soldiers; and each regiment was assigned to a particular portion of the country, with which it was to be intimately identified. The whole country was divided into six-and-six military subdistricts—fifty for England and Wales, eight for Scotland, and eight for Ireland; and these subdistricts, so far as recruiting purposes are concerned, are units, and are inseparably linked with individual regiments there localized. Thus, supposing Kent to be a subdistrict, and the 30th Regiment to be

affiliated to that county, Kent would be the home of both battalions of the 30th—though one of them might be always on duty abroad; its recruiting staff would be there, its history would be studied and watched by Kent men, and it would be the tradition of Kent to enlist in the regiment thus become peculiarly its own. Behind the two battalions of regular troops are two militia regiments, equally local, equally permanent, controlled by the same general officers, interchanging officers and men, and gradually impenetrated with the same traditions. The whole of the subdistricts are grouped into sixteen districts, each one, with the volunteers of the respective localities, forming, under a single officer in command, a minute army, called "No. — District Brigade." The army reserve men and pensioners resident in any brigade district are attached to the local force of their vicinity; and for each district there is a central depot from which all warlike stores, clothing, &c., needed for its contingent may be directly obtained without application to the War Office. The troops thus localized are trained together; there is a common exercise ground at the local centre; the officers of the line are encouraged to pass into the militia, while commissions in the line are granted to militia subalterns; the volunteers are annually exercised in connection with the regular and auxiliary forces of their district; and the staff of the depot has every branch of the military force of the district under its immediate cognizance and control.

The arrangements so far made were for the localization of our forces, and for recruiting and exercising them. It still remained to arrange for their prompt and united action in case of emergency. With this view the whole military forces were arranged into eight army corps, and in one or other of these every man of the various subdistricts and districts has a position. Each army corps is assigned to a particular portion of the country, and at this momentous it would rally on the order to mobilize. As defensive force is of little avail in war unless some power of offensive action is secured, two army corps are so situated as to be ready at short notice to be put on a ship. These are almost entirely composed of regular troops, and have their headquarters at Colchester and Aldershot. The immense value of such an arrangement was shown in a remarkable manner in 1882, when, in order to suppress the military rebellion in Egypt, a force of some 30,000 men, complete in all arms, and well furnished with commissariat and all needful stores, was, without the least confusion, told off for service; and within a few weeks had reached Egypt and put down the rebellion. Had such a compact force been available for equally prompt despatch to the Crimea in 1853, all the objects of that war might have been attained in half the time, and at much less than half the cost of both life and treasure. One of the principal advantages claimed for the new territorial system was, that in case of war it would be unnecessary to resort to the old and discredited system of volunteering; a single regiment to mother for the purpose of bringing up battalions ordered for service up to their proper strength, and in the case of the preparations for the Egyptian war no such volunteering took place in the infantry.

The six other army corps are considered as more purely defensive, and have their headquarters at Croydon, Salisbury, Chester, York, Dublin, and Edinburgh. Provision is also made for the defence of the coast, and for the garrisoning of fortresses by a "sedentary army," which is formed chiefly of volunteers, with a nucleus of regular troops, the various army corps being thus left wholly free for field operations: The garrison army, in which almost all the volunteers have their stations defined, is divided into separate commands for Portsmouth, Plymouth, Portland, Dover, Chatham (with Sheerness and Tilbury)—in other words, the mouth of the Medway and

Thames), Harwich, Pembroke, Edinburgh, Cork, Dublin, Jersey, Guernsey, and Alderney. Several of these include the charge of a large strip of coast. The yeomanry are all included in the several army corps, where their services, from their intimate knowledge of the country, would be invaluable in the important duties of outlook, reconnoitring, &c.

A good work of reference with respect to the laws affecting the army is "Statutes relating to the War Office and Army," by C. M. Clode, Legal Secretary of the War Department.

The following were the numbers and cost of the British military forces according to the Army Estimates for 1885-86:—

	No. of Men.	Cost.
Regular Army, Home and Colonial,	131,769	£5,029,600
Reserves,	53,250	381,500
Militia,	111,331	526,500
Yeomanry,	14,405	72,500
Volunteers,	251,117	606,000
Total, Home and Colonial,	592,175	
British Regimental Forces in India (borne on Indian Establishment), . .	61,597	
Total,	653,772	
Commissariat and Ordnance Store Departments,		6,891,300
Works and Building, and Miscellaneous Charges,		1,252,100
Total Effective Services,		11,782,900
Non-effective Services (Pensioners, &c.),		3,037,800
		£14,820,700

ARNATTO. See ASSATTO.

ARNAULD, ANGÉLIQUE, daughter of Robert Arnauld d'Andilly, and niece of the first or great Angélique, was born on the 28th November, 1624. Of a determined and strongly devotional nature, she became a nun at Port-Royal des Champs before she had reached the age of twenty years, and nine years later was made superioress, an office which she retained on her removal to Port-Royal de Paris a few years afterwards. An earnest and devoted Jansenist, she came in for a full share of the persecution to which that party were subjected. Her convent was broken up by royal order, and the inmates distributed in various convents throughout France, while every effort was made by the Jesuits to induce them to recant and sign the "Formula of Alexander VII." Their efforts were utterly futile so far as Angélique was concerned; and when Pope Clement IX. endeavoured to restore peace to the church and close up the controversy, in 1669, the nuns, who had previously been restored to their nunnery by command of the Archbishop of Paris, but had been kept under strict surveillance, received back their privileges. Angélique was again elected prioress, and in 1678 was made abbess. In 1679 her protectress, the Duchesse de Longueville, died, and her enemies recommenced their persecutions, and obtained an order forbidding her to receive any more novices. She died on the 29th January, 1684.

ARNAULD, ANTOINE, an illustrious French *arocat*, father of the "great Arnauld," was born at Paris in 1560. He was the eldest son of Antoine Arnauld, councillor of Catherine de Medicis, and was distinguished by his great eloquence and by his earnest opposition to the Jesuits.

He acquired great celebrity by his defence of the University of Paris against that society in 1594. This work was reprinted in 1717. He was also the author of another work directed against the Jesuits, and of several works on political subjects, which enjoyed considerable reputation in their day. He was accused by the Jesuits of being a Huguenot, but the charge was without foundation. He died 29th December, 1619. Of his family of twenty the most illustrious member was the youngest son, Antoine; but six of his daughters embraced conventual life, and became the founders and chief support of Port-Royal.

ARNAULD, ANTOINE, distinguished as the "great Arnauld," was born at Paris 6th February, 1612. The twentieth child of his father, he was trained at first for the bar, but showing a great dislike to the profession, he was dedicated by his mother to the service of the church. Entering the Sorbonne, he studied theology as a pupil of Lessot, confessor of Cardinal Richelieu, by whom he was introduced to the system of the Schoolmen; but Arnauld becoming acquainted with the works of Augustine, for whom he soon entertained the most intense admiration, his teacher quickly found his influence gone. In 1641 he was ordained priest, and two years later he published a work entitled "De la Fréquente Communion," which, though generally received with much favour, and approved by several bishops, archbishops, and doctors of the Sorbonne, gave great offence to the Jesuits, one of whom publicly denounced it as heretical, and declared the author to be worse than either Luther or Calvin.

Arnauld defended himself vigorously, and the controversy thus begun with the Jesuits was continued by him until the end of his life. The book which had raised the storm was finally examined at Rome, where it was defended by Janin, a doctor of the Sorbonne, only one sentence coming under condemnation.

This dispute was kindly settled, however, before Arnauld became engaged in another, which had a most important influence upon his career. In 1649 there had been published a posthumous work of Jansenius, bishop of Ypres, on Augustin, in which the doctrines of that father of the church upon the subjects of free will, human depravity, and Divine grace, were shown to be opposed to those of the Jesuits, who had inclined rather towards the doctrines of Pelagius. This work was condemned by Pope Urban VIII. in 1642, and the year following Arnauld boldly defended the book against the Papal censures, and took a prominent part in the controversy that followed, which is known after the name of the bishop. His pamphlets on this discussion were entitled respectively "Premières et Secondes Observations;" "Considérations;" "Difficultés;" and lastly, "Apologie de Jansenius." These controversial works were varied by others of a different character, and he published from time to time a series of books of a devotional nature, which displayed evidence of a deep and noble piety on the part of the author. He also undertook the direction of the convent of Port-Royal des Champs, of which his sister was abbess, and took part in company with his literary friends, in the preparation of the "Grammaire Générale Raisonnée," "Eléments de Géométrie," and "L'Art de Penser."

In 1649 the Jansenist controversy again broke out, and the work of Jansenius was condemned both by the Sorbonne and the Pope. Arnauld, notwithstanding, stoutly defended it, and the result was that in 1655-56 he was obliged to leave Port-Royal, and was at the same time expelled from the Sorbonne and from the faculty of theology. His defence was undertaken by his friend the illustrious Pascal, who, under the nom-de-plume of Louis de Montalte, published his famous "Provincial Letters," the materials for which were supplied by Arnauld. In 1658 Arnauld published his "Cinq Écrits en faveur des Curés de Paris contre les Calomnies jansénistes;" in 1662, "La Nouvelle Héresie"

and "Les Illusions;" and in 1669 the first volume of the "Moral Pratique des Jésuites," of which seven other volumes were published at intervals, the last of which was issued in the year of his death.

A controversialist to the backbone, he was next engaged in writing against the Calvinists, and published a work against that system in 1672, and another in 1675. In 1679 his enemies the Jesuits prevailed upon King Louis to issue an order for his arrest, and he was obliged to retire into Belgium, where, after wandering from town to town, everywhere pursued by the malices of his enemies, he died at Brussels on the 8th August, 1694. His spirit was unbroke to the last, and his earnest defence of what he felt to be the truth was maintained to the close of his life. His works, which amounted to upwards of 100 volumes, were published at Paris, 1775-83.

As a scholar and theologian he takes a high place among French writers, and though in his controversies he appears incapable of seeing more than one side of a question, there can be no doubt that his seeming intolerance arose from his earnest love of the truth, and his desire to defend it at all hazards. He enjoys, in addition, the reputation of a profound knowledge of metaphysics—a knowledge which was exercised to the signal benefit of philosophy. His chief works in connection with this subject were, the "Art de Penser," an excellent treatise on logic which quickly passed the boundaries of France, and became an especial favourite in Germany and England; and his treatise on perception, or, as he called it, on "True and False Ideas."

ARNDT, ERNST MORITZ, a celebrated German patriot, author, and poet, was born in the island of Rugen, in the Baltic, 26th December, 1769. He studied at Stralsund, Greifswalde, and afterwards at Jena, where he came under the influence of Fichte. He was intended for the church, but feeling no call to that profession gave up the idea, and after a few years spent in travel he settled in 1806 at Greifswalde as a private teacher.

In 1806 he was appointed professor of history at the University of that place, but having made himself famous by the publication in 1803 of his "History of Serfdom in Pomerania," and by a bold attack upon Napoleon in his "Spirit of the Times" in 1807, he was compelled to take refuge in Stockholm. He returned under an assumed name in 1810, and by his pamphlets and poems, and still more by his patriotic songs, he zealously supported the minister Stein in his efforts to arouse the spirit of the natives against the aggressions of France. After the successful War of Liberation he was appointed in 1818 to the chair of history at Bonn, but was suspended the year following for his democratic tendencies; and though he received the salary attached to that office, he was not allowed to return for the next twenty years.

He was a member of the German National Assembly in 1848, and retired with Von Gagern in 1849. He died 29th January, 1860, having entered his ninety-first year. His writings were very numerous, but he will be chiefly remembered as an ardent lover of his country, and as the author of some of the best of the patriotic songs of Germany. At commencing "Was ist der Deutschen Vaterland," and it is sung wherever the German language is spoken throughout the world.

ARNE, THE WAS AUGUSTINE, MUS. DOG., a celebrated English composer, was the son of an upholsterer of London, where he was born on the 12th March, 1710. He was educated at Eton with the intention of becoming a solicitor; but he preferred to the study of the law practising on the street, which he had secreted in a garret, and muffled so that he was not detected. He next borrowed a livery that he might often sit in the servants' gallery at the opera; and finally, having procured a violin, he

privately studied it to such good result that he was able to lead a small band at the house of an amateur. His father by chance accepted an invitation to one of the concerts, and was astounded to recognize his son as the leader. However, he wisely recognized that it was hopeless to contend against so manifest a decree of nature; and from opposing the young musician, now assisted him with regular instruction. He became violinist at Drury Lane Theatre, and in 1733 he produced his first great work, the opera "Rosamond," in which the part of the heroine was taken by his sister, who afterwards became popular as Mrs. Cibber. It was received with general approval. He was still more successful in 1738 in the composition of the music for the revival of Milton's "Masque of Comus." This work was marked by a display of originality and a cultivation of style that at once stamped his high character as a musician. In 1740 he wrote the music for Thomson and Mallet's "Masque of Alfred," in which the magnificent tune, "Rule Britannia," first appeared. It at once riveted attention, and has never lost its hold over the heart of the nation. The same year he married Cecilia Young, a popular singer. In 1744 he returned from a stay in Ireland, and was engaged by Garrick as composer for Drury Lane Theatre, adorning the great actor's Shakspearian revival of "As You Like It" with those musical masterpieces, "Blow, blow, thou Winter Wind" and "Under the Greenwood Tree." When the "Tempest" was produced in 1746 Arne wrote the music, amongst the rest, "Where the Bee Sucks," one of the most beautiful songs ever written. His works for the harpsichord, though simple, are full of elegant variety, and abound in melody. In 1759 he received the degree of doctor of music from Oxford. In 1762 he produced his opera of "Artaxerxes," which was first performed at Covent Garden, and which retained its popularity for upwards of eighty years. In it he, firm among Englishmen, ventured to abandon spoken dialogue for musical recitative. He died at the age of sixty-one on the 5th March, 1778. His son MICHAEL, who was born in 1741, inherited considerable musical talent; was the author of several operas and numerous other compositions and songs, some of which obtained great popularity. He died about 1806.

ARNHEIM or **AERNEM** (the Roman *Arenacum*) is the capital of the Dutch province of Guelderland; it stands on the right bank of the Rhine, 73 miles by railway from Amsterdam, and 50 miles by the river from Rotterdam. Arnheim stands at the foot of a small range of hills, called Veluwe, running toward towards the Zuyder Zee, and is one of the most active looking towns in Holland. The environs are a many villas, parks, and gardens, the residences of noblemen and "nobobs" from the East Indies. On the E. of the town are also some beautiful grounds—all open to strangers. There are bridges of boats across the Rhine. The town was fortified by Coehorn in 1702; the ramparts are now converted into promenades. The church contains the tomb of Duke of Guelderland, who formerly resided in the town. Catholic church and a museum. Col. are brought in great quantities to Arnheim, and there are some manufactures of tobacco, which is largely grown in the neighbourhood. The town has a considerable transit trade along the Rhine by means of steamers between Rotterdam and Strasburg; it has communication also with Amsterdam, Rotterdam, and other towns of Holland by railway through Utrecht. The population in 1882 was 42,090. Sir Philip Sydney died at Arnheim on 7th October, 1586, after having been mortally wounded at the battle of Zutphen. The town was captured from the French by the Prussians in 1813.

AR-NICA, a genus of plants belonging to the order

Compositæ. One species of this genus grows in Central Europe, the *Arnica montana*, and is known by the common name of Mountain Tobacco or Leopard's Baue. It was at one time admitted into all the British Pharmacopœias, but has been expunged from them for many years. In every part of this plant is found an acrid resin and a volatile oil, and in combination with these, in the flowers, is an acrid bitter principle, which they have called Arniceine, and the root contains a considerable quantity of tannin. In large doses it produces inflammation of the alimentary canal and coma. In small doses it acts as a general stimulant, increasing the pulsations of the heart, and acting as a diaphoretic and diuretic. It is used in Germany in cases of low fever, in nervous diseases, in amenorrhœa, and in adynamic diseases generally.

ARNO (called by the ancients *Arauna*), the principal river of Tuscany, rises on the southern slope of Mount Falterona, a projection from the central ridge of the Apennines, about 20 miles N.E. of Florence. It flows at first in a S.E. direction, but after its junction with the northern Chiana it suddenly turns to the westward, and passing through the valley of Laterina, it issues out of it by a narrow and wild pass called Valle dell' Inferno, which is 3 miles in length. The Arno next enters the beautiful region called the Val d'Arno, one of the most delightful rural spots in Tuscany. It is a valley about 14 miles in length, and from 3 to 5 in breadth, bounded by two ranges of hills, and sheltered on the N.E. by the lofty and rugged Apennines, among which the wooded summit is distinguished that overhangs the confluence of Vallombrosa. The valley itself is a continued succession of gardens and orchards, and the hills are covered with vineyards or verdant pastures. The river Arno, after a circuitous course of more than 60 miles, receives the waters of the Sieve at a point which is only 13 or 14 miles direct distance from its source; and then flows through the plain of Florence, dividing that city into two unequal parts. About 10 miles below Florence its waters are conducted through a deep artificial channel, cut by the old Etruscans; and a wider passage being thus opened for the river, the plain of Florence, which was a marsh before, was drained. The Arno also passes through the town of Pisa, after several considerable windings, and ultimately falls into the Mediterranean about 6 miles to the westward of that place.

The whole course of the river, with its numerous windings, is about 150 miles. Its breadth varies greatly; near Florence it is about 400 feet, but the waters are very low in summer, and the river is then fordable. Within the city of Florence the bed of the river is considerably narrower, being confined by the walls of the quays. Between Pisa and Florence the stream is navigable for barges; but in summer the navigation is often interrupted in consequence of the shallowness of the water. The Arno communicates with the Tiber by means of the Chian Canal. The tract of country watered by the Arno constitutes the most populous, productive, and thriving part of Tuscany.

The Arno, like all the rivers which descend from the Apennines, is subject to sudden overflowings. The quantity of earth and stones which it then carries down from the mountains has raised its bed in many places nearly as high as the adjacent fields. Embankments have been made along the greater part of its course, and are kept up at a considerable expense. But in cases of extraordinary rains and storms in the highlands where it has its source, the Arno rushes down with such fury as to overcome all obstacles and to inundate a great part of the country. Among the more disastrous inundations that of September, 1537, is recorded, when the Val d'Arno and the whole plain of Florence were overflowed, and trees, mills, cattle, and even houses were carried away. Two-thirds of the city of Florence were inundated, the water being in some

places 8 feet above the pavement; and two of the bridges of the city were carried away. In November, 1740, another great inundation took place, owing to the prevailing snow, which melted the snows that had fallen on the Apennines very suddenly.

ARNOLD or **ARNALDO OF BRESCIA**, one of the reformers before the Reformation, was born at Brescia, in Italy, in the beginning of the twelfth century. He was educated in France under Abelard and Berengarius, and adopted the life of a monk. Possessed of great eloquence, and well acquainted with the Scriptures, he vigorously assailed the prevailing corruptions of the clergy, and succeeded in rousing the people of his native place to revolt against these abuses. The influence spread throughout Italy, and disturbances having taken place in different parts of the country, he was cited before the second Lateran Council (1139), and condemned to banishment. He retired to France, but here he was so fiercely assailed by St. Bernard of Clairvaux that he was compelled to leave that country and take refuge at Zurich, where he dwelt for several years and made many converts. Meanwhile the ferment in Italy caused by his writings continued, and a popular insurrection against the government took place at Rome. Arnold hastened thither and endeavoured to persuade the people to revive the old republican form of government. He was well received and acquired great authority, but the determined and unscrupulous opposition of the Papal party, and the fickleness and violence of the people, made the city a scene of continuous disorder for ten years. Pope Lucius II. was killed by the people in 1155, and Eugenius III. was compelled to flee to France for safety; but in 1154 Adrian IV. reduced the city to subjection by enforcing the penalty of excommunication. Arnold fled to Compton, where some influential friends gave him protection for a time; but in 1155, when Frederick I. came to Rome for coronation, Arnold was arrested and taken to Rome, where he was tried and condemned to death. He was hanged, his body being afterwards burned, and the ashes thrown into the Tiber. He was a man of a pure and ascetic life, and an earnest advocate of reform in the church; but inasmuch as he taught that temporal dignities and great wealth should not be possessed by the clergy, who ought to have nothing but their spiritual authority and a moderate subsistence, it is easy to understand his untimely fate in a city in which he lived. A monument to his memory was erected in his native town in 1882.

ARNOLD, THOMAS, D.D., was born at Cowes, in the Isle of Wight, 15th June, 1795. His father, William Arnold, was collector of the customs in that place. At the age of eight he was sent to Westminster, and four years afterwards to Winchester College. As a boy he was remarkably shy and taciturn, a character which presented a strong contrast to the frankness and activity of his subsequent life. In 1811 he was removed to Oxford, having obtained a scholarship in Corpus Christi College. Here he devoted his attention chiefly to the philosophers and historians of antiquity, among whom his favourite authors were Aristotle and Thucydides. In 1814 he took a first-class degree, and the year after was elected fellow of Oriel College. In 1815 and 1817 he was chancellor's prizeman for the Latin and English essays. Having over-estimated some points in the Thirteenth Articles, with which he appears to have been unacquainted at the time he graduated, he was ordained in 1818. In 1820 he married, having in the previous year settled at Ladbroke, near Stroud, where he employed himself in the preparation of seven or eight young men for the universities. Here a great and decisive change came over his character. The timidity and self-doubtfulness by which his early years had been marked entirely disappeared, and he acquired those

settled, serious, earnest views of the nature and purpose of life which actuated him ever after. The time which was not occupied with his pupils was devoted to collecting materials for his edition of Thucydides, writing articles on Roman history for the *Encyclopædia Metropolitana*, and preparing the way for his "History of Rome," which he did not live to finish.

In 1828 he was elected head-master of Rugby School. Here his great talents for instruction and the management of young men acquired a suitable sphere for their activity. The result was soon apparent, not only in the eminence which Rugby rapidly obtained, but in the beneficial change which, by its example, was impressed upon other institutions of a similar nature. Dr. Arnold retained the old classical basis of tuition, but gave it breadth by connecting it with other departments of learning; inspired it with life and vigour by the practical views to which he directed it; and imparted to it elevation and dignity by what had heretofore been wanting in public schools—the introduction of a high moral and Christian element. A well-known saying of his is very characteristic:—"It is not necessary that this should be a school of 300, or 100, or 50 boys; but it is necessary that it should be a school of Christian gentlemen." As he could not come into frequent personal contact with every one amongst his pupils, he governed the school, and made his influence felt through the whole of it, by means of the sixth form, or highest class of boys. To add to their authority, and for the sake of maintaining order and government among the boys themselves, he kept up the system of flogging; but he stripped it of its repulsive features, and invested it with a moral force, by making it the ground of a solemn responsibility on the part of those who exercised the power. His views on this subject will be found in the *Journal of Education*, 1834-35, to which there is a reply by Professor Long, the editor of that work. In this occupation he spent the last fourteen years of his life, and during that period, though so diligently engaged in his own proper duties, took the deepest interest in all the events and political questions of the time. In 1834 he was elected a fellow in the senate of the new London University, and accepted by Dr. Arnold, but he withdrew on account of the theological examinations not being sufficiently important to hold a sufficiently important place in the curriculum.

The year before Dr. Arnold's death he was appointed by Lord Melbourne to the regius-professorship of modern history at Oxford, an appointment which gave him the most lively satisfaction. But he lived to deliver only his introductory course of lectures. He died on the 12th of June, 1842, at the close of the half-year, of spasms at the heart, and was buried in the chapel at Rugby. He left a widow, with six sons and four daughters. One of the sons, the well-known poet and critic Matthew Arnold.

His correspondence is the best record of his life, and affords the most vivid representation of his character. It was published in two volumes, with a *Life* by the late Dean Stanley, 1839. His chief work is his "History of Rome." He also published an edition of Thucydides, with notes, and five volumes of sermons. His miscellaneous works have been collected in one volume. A sketch of Rugby under Dr. Arnold, of great power and admitted fidelity, bears the name of "Tom Brown's School-days." The author is Mr. Thomas Hughes.

ARNOTTO. See **ANNATTO**.

ARNSBERG, a town in Prussia, the chief place of the circle and department of the same name, in the province of Westphalia, is situated on a hill half surrounded by the Rühr, about 40 miles W. of Paderborn. It commands a delightful prospect of the mountainous scenery round it, and of the ruins of the ancient castle in the old town, in which the meetings of the "Holy Felmo" were sometimes

field. [See FIGURE.] Weaving, brewing, and distilling are carried on at Arnberg; there are also one or two factories, and works for making railway plant. The town is the seat of government for the department, and has a court-house, gymnasium, &c. Population, 5000.

ARNSTADT, the chief town of the upper division of the principality of Schwarzburg-Sondershausen, in Central Germany. It is delightfully situated on the Gera, 11 miles S. of Erfurt, to which there is railway communication. There are four churches, several government offices, and a college. The town has some woollen, linen, and cotton manufactures, and a good trade in leather, linen, fruit, grain, and timber. A profusion of gardens and orchards lie scattered round the town; and the remains of two ancient castles, the Küfernburg and Altenburg, are striking features in its environs. There are copper mines in the neighbourhood, and tepid saline springs the waters of which are used for bathing. Population, 10,516.

AROIDACEÆ is an order of monocotyledonous plants, of which a good example is the *Arum*. The flowers are very simple in structure; the perianth, which is the most attractive feature in the lily, iris, orchids, and many other monocotyledons, is among the Aroidaceæ either altogether wanting, or consists only of a few scales; and in many genera (e. g. in *Arum*) the flowers are imperfect, or consist only of stamens, or only of a pistil. They are crowded together on an upright stalk (the *spadix*)—in *Arum* the staminate flowers in a ring above the pistillate. The whole are usually inclosed by a leafy structure called the *spathe*. This spathe is often very handsome, white in the “trumpet-lily” (*Richardia africana*), and of a brilliant scarlet in *Anthurium Scherzerianum*. The various juices, colocasias, and caladiums form handsome plants. The acid juice is so powerful in some as to be poisonous; the dumb cane of the tongue if only chewed. This is removed by roasting or boiling, though in some cases he used as food in the tropics, and some other species are among the negroes; but they are not with Europeans. The British is eatable, when prepared. During maturing from the bud, and large quantities of oxygen are taken much heat is evolved, and there fore of the plant. This phenomenon by a thermometer in the Aroidaceæ, prevents the ready escape of the heat. Aroids grow abundantly in tropical swampy forests, in which many species down aerial roots.

AR OLSEN, on the Aar, 23 miles residence of the princes of Waldeck. The place is a handsome structure of spacious dimensions; it contains a gallery of paintings, valuable collections of antiquities, and a library of 80,000 volumes. Population, 2500.

AROMATIC VINEGAR, the most powerful perfume made by the combination of strong acetic acid with essential oils, by which means the pungency of the acid is improved by the fragrance of the perfumes. The choice of perfume varies according to the taste of the maker, but those which are in most general use are the oils of cloves, lavender, rosemary, and calamus root. It is generally used as a refreshing excitant in cases of fainting, headache, and languor, and in the sick-room generally.

AROMATICS are agents obtained from the vegetable kingdom, exercising a peculiar influence over the digestive powers, and possessed of more or less odour or fragrance. Of this odour, by which they can at all times be recognized,

the most usual vehicle is an essential or volatile oil. Indeed, volatile oil exists in all aromatic plants, and in every part except the cotyledons, save in the nutmeg and a very few other seeds; but this aromatic oil does not reside in the same part in every kind of plant. In umbelliferous plants we find it mostly in the fruits (the *ritter*), yet in angelica, celery, and parsley it is diffused through the whole structure. Labiate plants, such as mint, balm, rosemary, and lavender, have it in the leaves and stem; cinnamon in the bark; all terebinthinate plants in their young branches. The *Iris florentina* (orris) and others have it chiefly in the root; the Scitamineæ equally in the root (ginger) and the seeds (cardamoms); the rose and camomile have it in the petals, yet it is not equal in all the petals of the camomile, being greatest in the yellow florets of the disk; hence, doubling the flowers of the camomile, by which the yellow florets of the disk are diminished and the white florets of the ray increased, lessens the virtue of the flowers.

Aromatics are seldom applied to the organ of smell for the purpose of influencing the system in a remedial manner, but are usually introduced into the stomach. As all aromatics contain volatile oil, their action is generally referred to this principle; but there cannot be a doubt that the more fixed principles which they contain contribute greatly to their effect. Volatile oils, when separated, act chiefly on the nervous system; but aromatics influence the digestive organs, the function of assimilation, and the circulation. They are themselves digested, but previous to this process commencing, or going any length, they produce, by direct contact with the internal surface, a peculiar effect, which we perceive in zingiber, of the lips and palate, and accompanying them in their progress to the stomach. They severely excite any general action of the system, but expend their power chiefly upon the stomach, and in a less degree upon the intestinal canal, increasing the vital force of the former and quickening the muscular action of the latter. They also communicate to the stomach a greater power of resistance to unpleasant sensations, as under their influence many articles can be borne by it which would otherwise be rejected.

The necessity for the employment of aromatics is greater in warm climates and weather than in cold; and we find the plants which furnish them grow in the greatest abundance in hot countries. Throughout the East Indies the natives restore the powers of the stomach by chewing betel, which consists of slices of the areca nut spunkled with fresh lime wrapped up along with some aromatic in a leaf of the *paper betel*. The Indians of South America use the *Erythrorhizon Peruvianum* (called *coca*) along with the leaves of the *Chenopodium Quinoa*, mixed with quicklime, to stimulate the impaired powers of the stomach during their long and toilsome journeys over the heights of the Andes. On the same principle, the Europeans who visit tropical countries use curry and other dishes. But in every quarter of the globe we find condiments used along with all articles difficult of digestion.

ARONA, a town in Northern Italy, on the western shore of the Lago Maggiore. It is connected by railway with Genoa and Turin. St. Carlo Borromeo was born in this town, and on an eminence in the neighbourhood a colossal statue was erected to his memory in 1697. The hands, and feet are made of bronze—the remaining portions of copper. This statue is nearly 24 yards high, and placed on a pedestal 15 yards in height. It is hollow, and can be ascended from within. The head affords room for three or four persons, and a beautiful view is obtained through the eyes of the statue. When Garibaldi was fighting alone, in 1848, against the Austrians, and was master of the Lago Maggiore, he took possession of this town, and found means to carry on the war for a fortnight. With only 2000 volunteers he kept in check 30,000 Austrian

soldiers, and defeated them twice at Luino and Murassone. Arona is a neat and bustling little town, with a small harbour on the lake; it carries on a considerable trade with Germany and Switzerland. Its situation is delightful, just within the last range of hills above which the snowy Alps are seen towering, and at the opening of the wide plains of Lombardy. The neighbourhood produces good wine. Population, 8500.

ARPEGGIO (Ital. *arpeggiare*, to play the harp), the notes of a chord sounded in succession from the lowest note to the highest, instead of the whole chord being sounded simultaneously. Harmonies are usually "sprinkled" on the harp, whence the name of this most elegant variation from rigid severity of performance. Like all graces, its use must not be pushed to excess; its function is to relieve, not to supplant, exact playing.

ARPI'NO (the Roman *Arpinum*). This very ancient city is situated 68 miles S.E. of Rome, and 65 miles from Naples. It stands in a beautiful situation on an eminence to the left of the river Garigliano, and near the confluence of the Fibreno (the ancient Fibrenus) with the Garigliano; the modern name of the ancient *Liris*. The population is about 12,000. Woollen cloth, parchment, paper, and leather are manufactured in the town and its vicinity.

The old town, which before the extension of the power of the Roman republic formed part of the territory of the Velsci, was built on the summit of a steep rock. An ancient arch, presenting a sharp arrow-head, in the style of the Gothic arch, a considerable extent of Cyclopean walls, an ancient cistern, four subterranean arches, and other ruins, still remain. Arpinum is often mentioned in Roman history; it was the birthplace of Marius and Cicero. The ancient remains, in addition to those already mentioned, existing in and about Arpino, are the cloacæ or common sewers of the city—which, like those of Rome, are capacious, and built in the finest manner—and the ruins of a Roman skew bridge across the Liris, between Arpino and Sora. This bridge the people fondly assign, as they do almost every vestige of antiquity in the neighbourhood, to their great countryman, and have always called it "Il Ponte di Cicerone."

AR'QUA, a village in Italy, 13 miles S.W. of Padua, famous as containing the house in which Petrarch died in 1374. His furniture is still preserved, and the house in which he died was presented to the municipality of Padua in 1875.

ARQUEBUS. See **ARMS**.

ARRACA'CHA is a genus of plants belonging to the order *UMBELLIFERÆ*. It comprehends a species of as much importance in the tropical parts of America as the parsnip and carrot are in Europe. This plant (the *Arracacha esculenta* of botanists) is cultivated in great quantities in the South American Andes. It resembles the common hemlock in appearance, but is smaller, the leaves are much broader, the stems are not spotted, and the flowers are of a dingy purple colour.

The root is of the same nature as the tuber of a potato, only it is forked, or divided into several lobes, each of which is about the size of a large carrot. These, when fit for eating, are boiled and become of a firm but tender consistence, not at all mealy, and have a flavour intermediate between a chestnut and a parsnip. An immense produce of Arracacha is obtained in South America, where it has long been as much the staple nutriment of the population as the potato or the yam in other places; and as it will only thrive in the colder districts, it was once expected to form an important agricultural plant in Europe. It has, however, been found upon trial unable to accommodate itself to our uncertain climate.

ARRACAN. See **ARACAN**.

ARRACK', RACK, or RAKI are names given

throughout India, Ceylon, Siam, and the Indian Islands to distilled spirits generally, but more especially to that made from the sweet juice or toddy extracted from the unexpanded flowers of different species of the palm tribe.

In Ceylon, where a large quantity of arrack is manufactured, it is entirely distilled from cocoa-nut-tree toddy. The "toddy tope," or cocoa-nut-tree orchards, are very extensive in Ceylon, and their produce is collected for the distillation of arrack and the manufacture of sugar and oil.

In Ceylon, when it is intended to draw toddy from a tope, the drawer selects a tree of easy ascent, and connects the upper branches of other trees to it, so as to pass readily from one to another. He ties the flowering spath in different places, and bruises it with the blow of a small mallet; this is done twice a day for a week, after which a portion of the spath is cut off, and juice slowly exudes from it. Successive portions of each spath, and successive trees in the tope, are treated in the same way. The juice or toddy is collected in gourds, from which it is emptied into vessels.

Arrack may be distilled from toddy the same day it is drawn from the tree, but sometimes this operation is delayed until it becomes sour. The process of distillation is carried on in the maritime provinces in copper stills, but in the interior of the island earthen vessels are chiefly employed. Toddy yields by distillation about one-eighth part of proof spirit.

In India arrack is distilled from the flowers of two or three different trees. In Java it is made from molasses, palm wine, and rice; and in Turkey from the skins of grapes, flavoured with aniseed; the mountain Tartars distil it from many berries and fruits; and the Calmucks from fermented mare's milk.

Ceylon exports great quantities of arrack to India, and it is superior to any other. In Java it commands a higher price than in India, and is a part of the established rations to the army and navy, also to the seamen of the royal navy.

In Ceylon, it is distilled from rice which is called Sake, and is derived from the same source as

AR'RA the province of Behar, British India, 25 miles square. During the mutiny of 1857 a house was defended for seven days by twenty whites, and about fifty Sikhs, against a force of 3000, who ultimately abandoned the attempt to take it.

ARRAIGN. This word is derived by Sir Matthew Hale from *arraioner, ad rationem ponere*, which in ancient Law French means to answer, or abbreviated, *a-resner*. Arraignment is a summons, or person accused to the bar of a court of criminal justice, to answer to a charge made against him. The indictment at present consists in calling upon the prisoner to appear, and reading over to him the indictment, whether he is charged, and demanding of him judgment is then pronounced. If he pleads "Guilty," he is put upon his trial, and a jury of twelve men have to inquire into the truth of the indictment. Should the prisoner stand mute of malice and refuse to plead, the refusal is considered as being equivalent to a plea of not guilty, and the trial proceeds. In Scotch law the corresponding practice is termed "Calling the Diet."

ARRAIGNS, CLERK OF, the official who reads the indictment and calls upon the prisoner to plead.

AR'KAN (Gaelic, "Lofty Isle"), an island in Scotland, in the Firth of Clyde, and forming the larger portion of the county of Buté. It lies 6 miles S.W. of Buté Island, in the bay formed by the peninsula of Cantire and the

Ayrshire coast, and is about 4 miles from the nearest point of Cantire, and about 11 miles from the nearest point of Ayrshire. The greatest length is more than 20 miles, and the greatest breadth 12 miles. There is a carriage road round the island, generally near the shore. The surface is in general high, particularly towards the north end. The climate is temperate. It belongs chiefly to the Duke of Hamilton, under whom great improvements have taken place. His seat is at Brodick Castle. The landing pier for steamers and the principal hotel are at Brodick Bay, where there is a village with a church and school. In general the surface is very rugged and mountainous, but intersected by picturesque glens. The highest point is Goatfell, nearly 3000 feet above the sea. Numerous quartz and other crystals are found. The island has many Druidical and Danish remains, and is celebrated for its interesting geological and botanical features, and its picturesque beauty. Blackcock and grouse abound, while a few red deer and some wild goats still find shelter among the mountains. Oats, cattle, sheep, and fish are exported, and there are some whisky distilleries. Gaelic is spoken, but most of the inhabitants can also speak English. The population of Arran in 1881 was 4730—a decrease of 504 as compared with 1871. The island is a famous summer resort, and numerous steamers ply between it and the Clyde.

ARRAS, the capital of the former province of Artois, and of the present department of Pas-de-Calais in France, stands on the Scarpe, which is navigable up to this point. The town is a first-class station on the Paris and Brussels Railway through Amiens; its distance by this route from Paris is 133 miles, from Brussels 96 miles and from Amiens 42 miles. Arras may be regarded as consisting of three parts—the *Cité*, or what may be called the old town; the *Ville*, or the new town; and the *suburbs*, which was erected by Vauban, and is now a fine city, which, as modern artillery could easily demonstrate, might be easily taken. The *Cité* is separated by a ditch and walls from the *Ville*, which is a city of houses and large squares, surrounded by the modern part of the town; the *Ville* is a bold style of architecture, the site of an older Gothic building, which was destroyed in the Revolution; the town-hall and extensive barracks—entitle it to be ranked among the finest cities of France.

Arras is the see of a bishop, in the department of Pas-de-Calais. It is in the agricultural produce of the the manufactures of Arras itself, and Arras was at one time so celebrated in English its name became identified with the manufacture. One of the most important corn markets in France is held here.

Among the literary and scientific institutions are a college, several technical and other schools, a public library containing upwards of 40,000 volumes, a cabinet of natural history, museum, botanical garden, and several literary, commercial, and scientific societies. The population of Arras in 1882 was 27,000.

Arras appears in the Roman writers under the name of *Nemetacum*, but it afterwards took that of *Atrabates*, from the people who possessed the town with the surrounding territory. From this name *Atrabates*, both the town (*Arras*) and the country (*Artois*) received their designation. It appears from the writings of St. Jerome that in his time it was a manufacturing town, and had been pillaged by the barbarians. When the Franks first established themselves in the N.E. of France, *Arras* formed part of their dominions; and the earlier kings of France placed the lordship of the town in the hands of the bishops of

Arras, who retained it till the time of the Emperor Charles V. Having compelled the kings of France to give up the right of sovereignty over that part of the Burgundian dominions which had come to him by inheritance, Charles V. at the same time made them yield the city of Arras, which he then subjected to the temporal power. In 1640 the city was captured by the troops of Louis XIII., and by the treaty of the Pyrenees in 1659 France was confirmed in its possession. Arras was the birthplace of the brothers Robespierre, as well as of their associate, the infamous Lebon, at whose hands it suffered severely during the Revolution.

ARREST is a legal term implying the seizing of a man by authority of the law, and is used both in criminal and civil procedure. The law relating to criminal arrest has already been considered under APPREHEND.

In civil cases the Court of Chancery and all the superior courts possess the power of arrest for contempt. The term is more generally used, however, to signify the enforcement of the order of a court of law in order to satisfy judgment. In former times arrest was of two kinds, viz. that which took place before trial, and was called arrest on mesne process, or holding to bail; and that which took place after trial, and was called arrest on final process, or arrest in execution.

With regard to arrest on mesne process, since the statute 32 & 33 Vict. c. 62, s. 6, all civil actions, except the three real actions which still exist, must be commenced by writ of summons, and no defendant can be arrested before a judgment has been obtained against him, unless it be shown by the affidavit of the plaintiff, or of some other person, to the satisfaction of a judge of one of the superior courts, that such plaintiff has a cause of action against the defendant to the amount of £50 or upwards, or has sustained damage to that amount, and that there is probable cause for believing that the defendant is about to quit England unless he be forthwith apprehended. The judge is then authorized to issue a writ of *capias* against such defendant; the proceedings upon such writ are the same as they were under the writ of *capias* which formerly was used as the commencement of all personal actions which were commenced in the superior courts of common law, when the object was to arrest a person or hold him to bail. See *CAPIAS*.

This application to the judge may be made and the defendant arrested at any time after the commencement of the action, and before final judgment shall have been obtained therein. He can be discharged on finding special bail, or paying the sum claimed into court, or satisfying the judge that he is not going to leave the country.

Since the 32 & 33 Vict. c. 62 (the Debtors' Act, 1869), imprisonment for debt has been abolished in England, except in certain cases, and in these the period of detention must not exceed one year. But any debtor may be imprisoned for six weeks for non-payment of any debt or instalment of a debt as to which an order for payment has been made by a court, if it be proved that he has the means to pay and refuses to do so. This imprisonment does not cancel or extinguish the debt, and the right to take out execution against the property of the person imprisoned remains as if no such imprisonment had taken place.

There are certain classes, however, who are privileged, either entirely or temporarily, from arrest on civil process. Of the first are members of the royal family and the ordinary servants of the king or queen regnant; all members of the peerage, English, Scotch, and Irish, and the diplomatic representatives of foreign courts and their servants. Temporary privilege from arrest is enjoyed by members of the House of Commons during the session of parliament, and for a period of forty days before and after; by all persons connected with a cause before a court of justice, whether

parties, witnesses, attorneys, and barristers; and by elegy-men of the Church of England while engaged in performing divine service.

Arrest on final process, or arrest in execution, is one of the means by which a party who has succeeded in an action may compel performance of the judgment.

An arrest is made by seizing or touching the defendant's person and showing the warrant. The officer is not justified in breaking open the defendant's house in order to arrest him; but, when once the arrest is made, he may break into any house in pursuit of him.

ARREST OF JUDGMENT. After an action at law has been carried through all the stages previous to the judgment, and the plaintiff has up to this point been successful, the defendant may still move in arrest of judgment; that is, he may pay the court to withhold or arrest the judgment from the plaintiff, on the ground that there is some error on the face of the record which vitiates the proceedings. In consequence of such error, on whatever part of the record it may arise, from the commencement of the suit to this period, the court is bound to arrest the judgment. The error must be such as is apparent on the record; and generally speaking it must not be an error in a mere point of form. This was formerly otherwise; but certain statutes have been passed at different periods, called the statutes of *judicis* and amendments, by the effect of which judgments at the present day cannot, in general, be arrested for any merely formal objection. See *ARRESTMENT*.

ARRESTMENT, in the law of Scotland, is a process by which a creditor may attach money or movable property which a third party holds for behoof of his debtor. It bears a general resemblance to foreign attachment by the custom of London. See *ATTACHMENT*. The person who uses it is called the arrestor, he in whose hands it is used is called the arrestee, and the debtor is called the commanditor. It is of two kinds, arrestment in execution and arrestment in security. The authority of the feudal courts was only used in regard to arrestments, and the process was formerly regulated by the 1 & 2 Viet. c. 114. The practice on this subject will be found in Darling's *Process and Duties of Messengers-at-Arms*.

ARRESTMENT FOR FOUNDING JURISDICTION is an important legal procedure in Scotch law whereby any foreigner who possesses property in Scotland may be brought under the jurisdiction of its courts. In the case of real property no attachment is required, but in the case of personal property this process is necessary. When carried out it is held to give the court jurisdiction both over the property arrested and over the foreigner himself, and this principle has received the affirmation of the House of Lords.

ARRESTMENT OF WAGES, a mode of recovering debts which formerly exercised a very injurious influence over some of the working classes of Scotland. It was the object of a government inquiry in 1853, which revealed the fact that in most of the populous manufacturing districts unscrupulous debtors were forced who encouraged extravagance among the people by the sale of goods on credit, from the local justices who possessed of arresting wages before pay-day. The evils were seen in the most marked form among the young women, who, led by their desire for trinkets, frequently came under the power of an unscrupulous organization of tradesmen. Many households were found to be in a state of constant debt, from which they were unable to extricate themselves. To remedy these evils the Act 33 & 34 Viet. c. 63, was passed, which excluded from arrestment all wages not exceeding 20s. per week, and prohibited their arrestment under summonses for small debts, *i.e.* sums under £12.

In England, save in one or two exceptional cases, wages cannot be attached for debt.

ARRHENATHERUM (Gr. *arrhēn*, male; *athēr*, awn) is a genus of GRASSES allied to the cat. The lower of the two flowers between the glumes is male only, and has a long kneed and twisted awn springing from below the middle. The only British species is the oat-grass (*Arrhenatherum avenaceum*). Cattle are fond of this grass, but as it is not considered to be as nutritious as other kinds it is only used in pastures as a mixture.

ARRIANUS, FLAVIUS, a Greek writer, a native of Nicomedia in Bithynia, was probably born during the reign of Domitian or of Nerva, but the time is uncertain. In his youth Arrian was a pupil of Epictetus, who then resided at Nicopolis in Epirus. Epictetus died probably in the earlier part of Hadrian's reign, and Arrian commenced his career as a writer by publishing the "Encheiridion," or "Manual," which contains the moral doctrines of his master. [See *EPICETUS*.] He wrote also eight books, of which four are extant, entitled "The Philosophical Disquisitions of Epictetus," which, as he tells us in his preface, contain the very words of his master. Arrian thus acquired at once the favour of the Emperor Hadrian and the privileges of a Roman citizen, with the Roman name of Flavius. In A.D. 136 Hadrian appointed him governor of Cappadocia, and in this capacity he addressed a letter to the emperor, containing an account of his voyage from Trapezus (Trabzon) on the Black Sea, along its eastern coast as far as Diosenrias or Sebastopolis. This is the only date in his life that can be fixed with certainty.

After the death of Hadrian (A.D. 138) Arrian wrote numerous historical works; but that alone which is preserved is the "History of Alexander's Campaigns in Asia," in seven books, principally on the histories of the Egyptian king Ptolemy (son of Lagus) and Aristobolus, sons of Alexander in his wars, and the history of Alexander in his wars, inferior to that of Quintus Curtius, it is far more accurate.

Arrian's "History of Alexander," he wrote in the reign of Hadrian, entitled "Indica," which contains a description of the natural productions of India and its inhabitants. His remaining works are the "Periplus" (sailing round) of the Erythraean (Indian) Sea, and that of the "Erythraean" (Indian) Sea, entitled "The Order of Battle" against the Arabs, and a treatise on Hunting. Arrian shows by his remarks that he was well acquainted with field sports. His description of his favourite dog Horme, his constant companion and friend, is written with the feeling of a sportsman, and gives us a favourable opinion of his character. He is generally affected to imitate the Attic Greek of Xenophon, but the little treatise on India is written in a kind of Ionic dialect.

Arrian was born in 146, when Antoninus Pius was emperor, and died under his successor Marcus Aurelius at an advanced age, having retired from public life and become a priest of Demeter and Persephone in his native town.

Good editions of Arrian's History of Alexander are those of Ellendt (1832) and of Kruger (1835). The Periplus of the Euxine and Erythraean seas is in Hudson's "Minor Greek Geographers," vol. I; also in Gail and in Hoffmann. A translation of Arrian's book on Hunting was published by Bohn (London, 1831), with classical and practical annotations, and with an appendix and twenty-four embellishments from the antique. Arrian's book on the Erythraean Sea, and that on the Voyage of Nearchus, have been of late years excellently translated and edited by J. W. McIndle (London, 1879).

ARRIÈGE. See **AUTÈGE.**

ARRONDISSEMENT (from the French *arrondir*, to make round), a subdivision of a French department. Each arrondissement is presided over by a subprefect.

ARROO, a group of islands in the Asiatic Archipelago, situated S. and W. of Papua or New Guinea. The cluster consists of five islands, divided from each other by such narrow channels that the whole have been sometimes considered as one. The Chinese trade with the natives, procuring from Arroo pearls, tortoise-shell, edible birds'-nests, and an aromatic bark named missoy, which resembles cinnamon. Birds of paradise are very numerous, and are caught for their plumage. British goods, consisting chiefly of calicoes, iron, hardware, arms, and gunpowder, are exported from Singapore to this group.

AR'ROW-HEAD is a plant which belongs to the genus *Sagittaria*, and to the order **ALISMACEÆ**. The name is derived from the arrow-headed form of the leaves (Lat. *sagitta*, arrow). The stamens and pistils are numerous, and occur in separate flowers, but on the same plant. The one-seeded carpels form a head. The English species (*Sagittaria sagittifolia*) is a handsome plant, growing in ditches and rivers, with large shining leaves rising above the surface of the water, and small white flowers on branching stalks. *Sagittaria sinensis* is cultivated in China and Japan for the sake of the large eatable corns or bulbs, which, like potatoes, contain large quantities of starch. Both species are ornamental, and suitable for growing in ponds and lakes.

ARROW-HEADED CHARACTERS. See **COUNTER-POINT CHARACTERS.**

AR'ROW-ROOT is a farinaceous substance prepared from the roots or tubers of various plants—that from America and the West Indies being from the *Maranta arundinacea* and *Maranta indica*; the latter being from the *Maranta arundinacea* and *Maranta indica* species of Cineraria. The cassava supplies *Brazilian arrow-root*, agglutinated on hot plates. In the East Indies. Among other substances is the cuckoo-pint made in the Island of Portland as *Portland arrow-root*. It is prepared by boiling the tubers in a mortar, separating the fibrous matter with a quantity of water, and passing it through a hair-sieve; and then suffering the pure remaining milk-like fluid, after still further by successive washings, moisture is at length evaporated by air, and when perfectly dry the powder is packed in boxes or casks, in which state it may be kept for many years. West Indian arrow-root is usually pure white, and East Indian has a yellowish tinge. The taste is insipid, and the powder emits a crackling sound when pressed in the hand, and retains the impression of the fingers, which common wheat-starch does not. It is frequently adulterated with potato-starch; which, however, is not, like genuine arrow-root, soluble in cold water. Compared with wheat starch, arrow-root yields, when dissolved in equal proportions in warm water, a thinner and more slimy solution. Being very easy of digestion, arrow-root constitutes a valuable article of food for children and delicate persons. It is used mixed with boiling water or milk, or in the form of puddings, and may be given plain or with wine or spices. Potato-starch is not so digestible, and if prepared from potatoes in the spring is liable to disturb the stomach. The common English name of this preparation is derived from the use to which the South American Indians applied the roots of a plant called *Alpinia galanga* as an antidote against poisoned arrows. Large quantities of arrow-root are now produced in Queensland.

ARSA'CES was the founder of the Parthian monarchy. Justin speaks of him as being "of obscure origin, but tried valour, used to live by robbery; who, in the belief that Seleucus Callinicus was conquered by the Gauls in Asia, attacked Andragoras, the governor of the Parthians, and took possession of the empire of that nation" (xli. 4). But according to Arrian ("Phot. Bibl." No. 58), a personal quarrel led him to revolt from the Syrian empire, B.C. 250, during the reign of Antiochus Theos, father of Seleucus, who, busied with his Egyptian wars, neglected this new source of disturbance until Arsaces had gathered a sufficient party to resist him successfully. Seleucus Callinicus made two expeditions into Parthia: the first failed, and the second was still more unfortunate; for he was defeated in a great battle, taken prisoner, and died in captivity. The day of that defeat was long observed by the Parthians as the commencement of their independence. Arsaces reduced the neighbouring district of Hyrcania, and died, according to Justin, in a "ripe old age." Arrian, however, states that Arsaces died after a reign of two years, and that his brother Tindites succeeded him, and ruled for thirty-seven years as Arsaces II.

ARSA'CIDÆ, a name given to the Parthian kings, from Arsaces, their progenitor. A handsome silver drachma of Arsaces VI., wearing the characteristic head-dress of Parthia, will be found in fig. 11 in Plate I. COINS. See **PARTHIA**.

AR'SENAL, a public establishment where naval and military engines or warlike equipments are manufactured or stored. The name is sometimes used to designate places that are merely storerooms for warlike materials, but more generally to those where they are manufactured as well. In England large quantities of powder are made by private manufacturers for military purposes; there are small-arm makers at Birmingham; and the factories of Armstrong and Whitworth, where guns of heavy calibre are made, possess a world-wide reputation. In the United States there also exist large trade factories of the same kind; and on the Continent the armies of Germany, Russia, Belgium, and Turkey derive a large proportion of their artillery from the great factory of Krupp on the Rhine. As it would be manifestly unsafe, however, to depend upon private industry and enterprise in these matters, most countries undertake the manufacture for national purposes. In France the chief arsenals are at Paris, Cherbourg, Brest, and Toulon; in Germany, at Spandau, Cologne, and Dintzow. In England extensive stores are kept at the dockyards of Chatham, Sheerness, Portsmouth, Plymouth, and Pembroke. Small arms are made at Enfield, and powder is manufactured at Waltham Abbey. The only place, however, really worthy of the name of arsenal is the great establishment at Woolwich, where nearly the whole of the military factories are concentrated. An ancient depot for military stores, it was constituted the Royal Arsenal in 1805, and has gradually grown in importance and extent ever since. At the present time it occupies a space of 333 acres, and comprises a gun factory capable of producing over 6000 tons of guns per annum. It has also a laboratory for the manufacture of ammunition, where cartridges for small arms, heavy shot and shell, fuzes, rockets, torpedoes, and powder and cartridge barrels, boxes, and cases are made in enormous quantities. Upwards of 1,500,000 rounds of ball cartridge, 4400 rockets, and 6500 projectiles can be turned out in a week, in addition to the other stores named.

It also comprises a carriage factory for the manufacture of carriages, platforms, &c., for both army and navy, and immense stores for the various implements when manufactured. The Indian army is supplied partly from Woolwich; but warlike stores are also manufactured to a considerable extent in India, where the government possesses important

arsenals at Fort William, Madras, Bombay, Allahabad, and Ferozepur.

ARSENIC (Symbol. As; atomic weight, 75). This peculiar metal, though long known, was first examined with tolerable precision by Brandt in 1733. It is very frequently met with in nature, sometimes in its pure metallic state, but more commonly combined with other metals, as iron and cobalt, or with sulphur, and frequently united with oxygen. Arsenic has a steel gray colour and considerable brilliancy; its density is 5.700 according to Berzelius, and 5.884 by Turner's experiments; when sublimed, Dr. Thomson states that its density is only 5.235. The native metal is granular, and the artificial crystalline; it is extremely brittle, and consequently easily powdered. When arsenic is exposed to the air it soon loses its lustre, and becomes black on the surface; when kept under water it undergoes no change. If heated to 356° Fahr. it is volatilized, without previous fusion; the vapour has a strong smell, resembling that of garlic, and this to a certain extent is relied upon as a proof of its presence. The vapour readily condenses as a dark gray crystalline powder easily oxidizable by air; if, however, the arsenic be condensed at a temperature but little below its point of volatilization it deposits in compact brilliant crystals of metallic arsenic, and in this state is difficult of oxidation by air even when powdered and heated. When strongly heated, arsenic takes fire and burns with a pale blue flame. Arsenic forms triatomic and pentatomic compounds, in this respect resembling antimony. The most important arsenious or triatomic compounds are arsenious anhydride or acid (As_2O_3), arsenic trihydride or arsenetted hydrogen (AsH_3), chloride of arsenic or butter of arsenic (AsCl_3), and arsenous sulphide (As_2S_3).

Arsenious acid, or white arsenic, is the best known combination of this metal. As a natural product arsenious acid is extremely rare. It may be artificially prepared by many processes; but these are needless, for arsenious acid is met with abundantly, and very pure, as an article of commerce, being formed and volatilized during the roasting of cobalt ores, copper pyrites, &c. It is first condensed in an impure state, and purified by a second sublimation in an iron vessel. Arsenous acid (oxide of arsenic, the white arsenic of the shops) occurs in compact masses of various sizes, colourless and opaque; the density is about 3.6; it has very little taste, but is a virulent poison. Arsenious acid dissolves sparingly in cold water. A hot saturated solution contains one part in ten of water; on cooling the greater part deposits, leaving in solution one part in thirty of water.

Arsenic acid is a compound of arsenic oxide (As_2O_5) with water. Arsenic acid forms three hydrates—monohydrate (HAsO_3), dihydrate ($\text{H}_4\text{As}_2\text{O}_7$), trihydrate (H_3AsO_4). It is formed by treating arsenious oxide with nitric acid, or with twelve parts of nitric and one part of hydrochloric acid. On heating either of the hydrates to redness arsenic oxide is produced.

Arsenic oxide (As_2O_3) exists in nature much more commonly than the arsenious oxide, in combination with lime, copper, iron, and lead. It is of a milk-white colour; it contains no water, but when exposed to the air attracts it until a solution of specific gravity 1.235 is obtained. The anhydrous acid has not a very strong taste, but the aqueous solution is extremely sour and poisonous.

Arsenic and hydrogen combine to form arsenetted hydrogen, a gas which, when subjected to intense cold, is condensed into a limpid liquid resembling ether. The gas has an extremely fetid smell; its specific gravity is 2.695. It is fatal to animals when it forms only one-tenth of the air which they breathe.

There is also a solid compound of arsenic and hydrogen, obtained by Davy by electro-chemical means.

Chloride of arsenic (AsCl_3). When finely divided

arsenic is thrown into chlorine gas, rapid combination occurs, accompanied by heat and light. This compound may also be produced in many other ways. It is a colourless oily liquid which combines with oil of olives and turpentine, and partially dissolves sulphur and phosphorus when heated. Its boiling point is 130°C . It is decomposed by water, and in the air gives off arsenious fumes. It is exceedingly poisonous.

Arsenic combines with bromine, iodine, fluorine, selenium, and phosphorus; but the resulting compounds are not important.

Arsenic and sulphur may be made to combine in four different proportions, of which two yield *realgar* and *orpiment*. *Realgar* (disulphide of arsenic, As_2S_2) is of a deep red colour, brittle, easily reduced to powder, inodorous, tasteless, and insoluble in water. Its specific gravity is about 3·338. It is found native, and may also be prepared artificially. It is poisonous, but less so than arsenious acid. *Orpiment*, trisulphide of arsenic, or in combination with basic sulphide, sulpharsenious acid (As_2S_3), is commonly composed of thin plates, which are of a very fine yellow colour, and flexible to a considerable degree. Its specific gravity is 3·452. It is insoluble in water and inodorous. It has many uses in the manufactures, and was formerly much employed as a pigment under the name of King's yellow.

Arsenic combines with most of the metals when fused with them, forming compounds which are generally very brittle. Its compound into copper is, however, malleable. With lead and antimony it forms very fusible alloys. It is added to the metal used for making shot, to keep the metal fluid sufficiently long to form regular globules. Arsenical alloys principally form an important class of bodies. Salts of arsenic are termed *arsenites*. Arsenite of ammonia is a white powder, adding caustic ammonia to arsenous oxide; the former for a saline mass is formed, which is inferior to that of potash forms a saline mass. In powder form, it is employed in making mineral acids. Arsenite of soda is a white crystalline salt, incorporated to the state of small granules. It enters into the formation of calcium and of barium arsenites. It is also used in the preparation of copper (Cu₂As₂O₃). Scheele's green, or arsenite of copper, Schweinfurt green or arsenite of copper, (3CuAs₂O₄ · C₁₂H₆CuO₃), are much used as fine yellow colors, and the arsenite of silver affords a

Salts which contain arsenic acid are termed *arsenates*. The *arsenate of lime* forms large rhombic crystals which may easily be converted into octahedral crystals of *diarsenate of ammonia*. *White arsenic* is an uncrystallizable deliquescent mass, and the *diarsenate* is a transparent crystal substance. *Sodium arsenate* and *diarsenate of soda* are crystallizable salts, and the *arsenates of barium* and of *strontium* are both soluble salts. *Arsenate of silver* is of a brick-red colour.

As to the general properties of arsenical acids and salts, we may remark that both the acids are precipitated yellow by sulphuretted hydrogen; the arsenites are precipitated yellow by the salts of silver, and green by those of copper, while the arsenates are thrown down red by the silver salts, and blue by the copper ones.

ARSENIC, MEDICAL PROPERTIES OF.—As metallic arsenic has no effect upon the human system, we will confine our observations to the employment and mode of action of the white oxide or arsenious acid, and its compound, the arsenite of potash. The white oxide being so often employed for the destruction of human life, a dread of its exists even among medical men, which has caused it to be less tried and its action less studied than most other medicinal agents, although its curative influence is great when properly administered.

If a small quantity of the white oxide of arsenic, such as $\frac{1}{10}$ th or $\frac{1}{15}$ th of a grain, be swallowed, in about a quarter of an hour the individual experiences an agreeable sensation of comfort and warmth about the stomach, which gradually extends itself over the whole of the abdomen. The appetite and thirst are moderately increased, the secretion of urine becomes more abundant, and the evacuations from the intestines often more frequent, and of a pulpy or pappy character. From the intestinal canal the peculiar action propagates itself over the whole system. The heat of the surface is augmented, and the increased temperature is experienced particularly about the forehead and eyebrows, and the skin is bedewed with a gentle perspiration. At the same time an increased strength and frequency of pulse is felt. The whole muscular system acquires energy and elasticity; the involuntary muscles especially become more powerful and vigorous in their action; the respiration is gently accelerated. The nervous system partakes of the impulse communicated to the frame, and the spirits as well as the courage of the individual rise, liveliness and regularity characterizing the whole functions of the system. The white oxide of arsenic is therefore a tonic, and its employment in small doses is not only safe but beneficial. The natives of Styria habitually use arsenic in quantities which would be fatal to those unaccustomed to it. Dr. MacLagen states that he saw one man take between 4 and 5 grains, and another 6 grains of white arsenic (*Edin. Med. Journal*, Sept., 1864).

Arsenate of potash, before its regular introduction into medical practice, had long been employed in Lincolnshire for the cure of intermittents, under the name of the "Tasteless Ague Drops;" and, from having been introduced into practice by Dr. Fowler, it is called "Fowler's Solution." It is the "Liquor Pharmacopœia, and is never given 3 or 5 drops, and should be taken an hour after a meal, to prevent immediate contact with the intestine still employed in intermittents, the great source of the quotidian often resisting. In rheumatic cases it has been found to be successful when the pains are markedly rheumatic in their return. whether these be general or local affections of the eye. In nodular rheumatism it is also very valuable. The nervous system it is useful, employed both internally and externally, with doubtful efficiency, since its use is accompanied by great pain. It may also be absorbed into the system when used externally, and give rise to arsenical poisoning.

ARSENIC, DETECTION OF. Of substances arsenic is that which has most frequently occasioned death by poisoning, both by accident and design; its symptoms are, however, so characteristic, and its reaction so well known and unmistakable, that it is almost certain of detection.

Supposing a white powder to have been found under suspicious circumstances, the following is one of the modes in which the investigation is carried on. A little of the powder is burned with black flux, under circumstances which will enable the charcoal of the flux to combine with the oxygen of the arsenious acid (if any be present in the powder) and liberate the metallic arsenic. If the operation be conducted with care in a fine glass tube, the presence of arsenic may be made evident by a ring of the metal condensed in the cold part of the tube, even when the particle containing it is so small as to be invisible to the naked eye. Heated on charcoal before the blowpipe the well-known garlic odour is developed. If any liquid, or the contents

of the stomach, are suspected to contain arsenic, one method is to add to them a solution of sulphuretted hydrogen. By the action of sulphuretted hydrogen on the arsenious acid a yellow solution is first formed, and by heat, or after exposure to the air, the excess of sulphuretted hydrogen is got rid of, and yellow trisulphide of arsenic is thrown down. This test makes evident the presence of $\frac{1}{1000}$ th part of the acid. This is collected, dried, heated with black flux, and metallic arsenic will sublime. The same treatment may be adopted with any substance supposed to contain yellow or red sulphides of arsenic (orpiment or realgar), supposing them to have occasioned poisoning.

With solutions containing arsenic, ammonia sulphate of copper gives an apple-green precipitate; nitrate of silver, a yellow precipitate.

Marsli's process has long been esteemed a delicate means of detecting the presence of arsenic. The liquid suspected to contain the poison is acidulated with sulphuric acid and placed in contact with metallic zinc, both of which must be previously ascertained to be free from arsenic; if any arsenic be present in the liquid under examination the hydrogen gas generated reduces and dissolves it, forming arsenetted hydrogen gas. This gas is to be lighted at a jet, and a piece of white porcelain or of glass is to be held over the flame, when, if any arsenic be present, a brilliant black spot of metallic arsenic is deposited on the glass or porcelain; or it is passed through and reduced in a long glass tube contracted at two or three points for convenience of sealing off. The escaping gas may be then burned and the arsenic deposited on cold porcelain, or it may be passed into a solution of nitrate of silver. Metallic silver will thus be deposited, and the whole of the arsenic remain in solution as arsenious acid.

Reinsch's method of proceeding is to boil a slip of bright metallic copper in the fluid suspected, previously acidulated with hydrochloric acid. If arsenic be present the copper is covered with a whitish alloy, and then by heating the metal in a test tube the arsenic is volatilized, and sublimes in the metallic state in the cold part of the glass. This method is susceptible of detecting even less than $\frac{1}{1000}$ th part of the metal. The precautions which require to be exercised in trying this process are, that the hydrochloric acid and copper are themselves perfectly free from arsenic.

For a full description of the manufacture of arsenic and of its uses see "Chemistry, as applied to the Arts and Manufactures."

ARSENICAL MINERALS. The geological position of arsenical minerals is confined to primitive districts, where they occur in metalliferous veins, usually associated with metallic sulphides, to which the arsenides have considerable analogy. The most abundant ores are arsenical cobalt, nickel, and iron, which are found both in veins and in beds.

The arsenic contained in any mineral may, in general, be readily detected by the blowpipe, owing to the characteristic odour of the vapour of metallic arsenic.

Native arsenic is usually found in veins, accompanied by sulphur and sulphides; it occurs massive, also in reticulated and stalactitic shapes, and of a curved lamellar composition, exceedingly like the layers of an onion. When fractured, the new surface presents a metallic lustre and a tin-white colour, which, however, soon tarnishes, becoming a very dark gray. It is brittle, has the specific gravity 5.766, and its hardness is 3.5.

Arsenical pyrites are a very valuable series of minerals, owing to properties of the metals with which the arsenic is combined. One species is the copper pyrites; another, copper metal; another, arsenical silver, which possesses a curved lamellar composition of thin crystalline plates. Arsenical pyrites possess a tin-white colour and a metallic lustre.

White arsenic is found crystallized in octahedrons, and

also in botryoidal and stalactitic forms, frequently pulverulent. It occurs in metallic veins, and probably is the product of the decomposition of other minerals. The lustre is vitreous, and colour white, with a slight degree of transparency. Its specific gravity is 3.698. It is readily recognized under the blowpipe; if alone, it is volatilized; if on charcoal, it is volatilized with the production of the well-known garlic odour.

ARSINOË, the name of a city in Egypt, whose site, at the head of the western branch of the Red Sea, and near the termination of the canal which unites the Red Sea and the eastern branch of the Nile, corresponds nearly to the modern Suez. Its name was derived from ARSINOË.

Arsinoë was also the name of a *nome*, or one of the ancient provincial divisions of Egypt, which corresponds to the modern Faioum.

ARSINOË, a daughter of Ptolemy I., king of Egypt, and of Berenice, was married to Lysimachus, king of Thrace, whose eldest son, Agathocles, had espoused Lysandra, the half-sister of Arsinoë. Arsinoë induced her husband to consent to the death of Agathocles, and Lysimachus was involved in war with Seleucus in consequence of this crime. Lysimachus fell in battle in Asia, and his kingdom was seized by Seleucus. Seven months afterwards Seleucus was assassinated by Ptolemy Ceraunus, who then married Arsinoë, though she was his half-sister. Afterwards he murdered her two children, and their mother he banished to the island of Samothrace. (Justin xxiv. 3.) Arsinoë probably remained at Samothrace till she was summoned to Egypt, to become the second wife of her brother, King Ptolemy II. Philadelphus, king of that country, who reigned from B.C. 284 to 246. This was the first example of such a marriage among the Greek kings of Egypt.

A statue of Arsinoë existed at Athens in the time of Pausanias (i. 8. 3); and there is a beautiful gold medal of her in the British Museum.

AR SIS and **THE SIS**, terms of rhythm, arsis being the strong accent, thesis the weak one. The modern practice being to indicate by a down beat the strong accent by a down beat, and the weak one by an up beat, arsis has come to mean "down" and thesis "up"; but their original meanings were exactly the reverse, for the Greeks, who used them with reference to choral dances in the theatre, naturally designated the first or upward motion of the springing foot by arsis, "a rising," and the succeeding movement by thesis, "a falling." So also with the pitch of the voice in recitation; arsis amongst the Greeks indicated a rise in pitch of the voice, thesis a fall in pitch. But as a rise in pitch generally comes on the principal syllable, or what answers to the first beat of the bar in music, it is easy to see how the modern use above indicated has arisen. Nevertheless it is to be regretted that we should use a Greek word "up" to mean our "down," and *the arsis* and *thesis* generally, therefore, now use "down and up beat" in preference to arsis and thesis, while grammarians adopt "strong and weak accent," so that ambiguity is avoided.

AR SON (*from arson*, to burn) signifies, according to the old common law doctrine, the offence of maliciously burning the house of another. But the statute 21 & 25 Vict. c. 97 has given a more extensive signification to the term; it enacts that if any person shall unlawfully and maliciously set fire to any church or chapel, or other place, or to any house, warehouse, office, shop, mill, malt-house, barn, store-house, granary, hotel, shed or fold, or any farm building, whether in his own possession or in possession of any other person, he is guilty of felony. In fact, the act extends to every malicious burning of any buildings or any goods. The perpetrator is from imprisonment for two years to penal servitude for life. The firing must be wilful in order

to constitute the crime of arson; but an intent to injure or defraud may be inferred from circumstances; nor is it any defence to a charge of arson to show that the accused had no particular malice towards the owner of the property.

ART. The original meaning of art is simply "skill," and this it has never lost, for the root *ar*, to acquire, to fit, is one of those primitive ARYAN roots the discovery of which is the triumph of modern philology. But since skilled labour may be used for ordinary purposes, and also for purposes of luxury, a distinction at once arises between the *useful arts* and the *FINE ARTS*. By this it is by no means intended to signify that a fine art is useless, but that its end is not usefulness. The contrast is between the necessary and the luxurious, between utility and beauty, between industry and pleasure. The immediate end of fine art is indeed pleasure, but in elevating the mind and humanizing the character it fills in the long run no less useful a part than the useful arts distinctively so called. The two divisions are constantly interweaving with one another. Thus the useful art of building is very difficult to divide from the fine art of architecture, and even such every-day matters as dress, cookery, and the like, continually develop truly æsthetic elements. The useful arts will be treated of under their respective headings, as will also the fine arts; but the latter, in addition, will have a general article, **FINE ART**.

ART TA (the ancient *Ambracia*), a town of European Turkey, in Albania, is situated on the left bank of the river of the same name, 7 miles from the north shore of the Gulf of Arta and 36 miles S.S.E. of Janina. Arta is a bishop's see, and has several Greek churches. In the business quarter, which has its separate street or bazaar, and articles of cloth manufactured here are held in high estimation. The most notorious shaggy capotes of Arta, are considered the finest. Arta adds, coarse cottons, and Russian goods are also sold. The streets were widened and paved with flagstones in 1869. The population is about 8000, and the town is also a *polis*.

ART TA GULF, a gulf, or arm of the Ionian Sea, between the ancient *Ambracia* and Acarnania. The entrance is in some of its inlets a mile broad, but the gulf afterwards narrows into a strait, and runs 25 miles inland. The shores are steep and rocky, but the navigation is in parts very dangerous. The *Arta* banks and rocks. The town of *PREVESA* and the *monastery of ACHIM* are at the entrance, on the eastern side. The gulf abounds in fish of the finest quality, particularly of the mullet kind; there are also soles, *Antoetichards*, and very large prawns. There is a rise of *about 2 feet* in the gulf, but this is so much influenced by the wind that it cannot be considered as a regular tide.

ARTABANUS, the last of the Parthian dynasty of the Arsacids, came to the throne by dethroning his brother Vol-gases V., A.D. 215. Caracalla, the son and successor of the Emperor Septimius Severus, having asked and obtained in marriage the daughter of Artabanus, entered the country with a Roman army, and in the middle of the festivities gave orders for a massacre, A.D. 216, from which the king himself escaped with difficulty. To revenge himself, Artabanus took the field with a numerous army. Caracalla was assassinated on his march between Carrhae and Edessa, and was succeeded in the Roman empire by Macrinus. After a hard-fought battle of two days, the Romans came to terms; but meanwhile ARTAXERXES, otherwise called Ardshir, took advantage of the losses sustained by the Parthians to incite the Persians to revolt. When the revolt had been maintained three years, the king and his rebel subject met, and after three days' hard fighting Artabanus was defeated and killed, A.D. 229. The Parthians in consequence became subject to the Persians, after having

been their masters for 475 years. (Herodian, iii. c. 9; iv. c. 10 to 15; Lives of S. Severus, Caracalla, and Op. Macrinus in the "Historia Augusta;" Bayle, "Anc. Univ. Hist." v. xi.)

ARTAXERXES or **ARTOXERXES**, a Persian name, composed of *arta*, honoured, and *xerxes*, which is the same as the Zend *kaethra*, king. *Arta* very commonly occurs as the first part of many ancient Persian names, such as Arta-banus, Arta-pates, &c. *Ares*, *Mars*, *rir*, and *arta*, seem to have the same root, and to have the common signification of courage and manliness.

ARTAXERXES, surnamed Longimanus, from his right hand being longer than his left, was the second son of Xerxes I., and succeeded to the throne on the murder of his father and his elder brother Darius by Artabanus, B.C. 465. During his reign the Egyptians revolted under Inarus, B.C. 460, and nearly freed their country from the yoke of the Persians. They also received a numerous body of Athenian auxiliaries. Artaxerxes sent his brother Achæmenes to reduce them to obedience, but he was defeated and slain. In a second expedition which he sent under Artabazus and Megabyzus, the Athenians were obliged to evacuate the country, B.C. 455, leaving Egypt in the hands of the Persians. The Athenians now sent a body of troops under Cimon to take possession of Cyprus. Cimon defeated the Persians several times, and nearly reduced the whole of the island, when he was cut off by disease, B.C. 449. Peace was then concluded on conditions favourable to Greece.

Themistocles, when he fled from Greece, found an honourable reception at the court of this Artaxerxes. [See THEMISTOCLES.] (Thucydides, i. 101-110; Diodorus, lib. xi. xii.; Buehr's ed. of Ctesias, 1824.)

ARTAXERXES, surnamed Mnesius, the excellence of his memory, was the eldest son of Xerxes, and succeeded to the throne on the death of his father, B.C. 405. His younger brother, Artabanus, who claimed the throne, conspired against him, and was executed. Artaxerxes, however, had been his pardon, and even his confinement to the maritime provinces of Asia. He collected a large force with the Greek mercenaries to attack the throne, and proceeded with the body of Greek mercenaries to attack the expedition of which Xenophon has an interesting account. [See ANABASIS.] On the 10th of Chumaxi, about 10 miles from Babylon, the expedition had revealed to all Greece the weakness of the Persian empire, and Agesilaus was appointed to command the Spartan troops in Asia Minor. He overcame the greater part of the western province of Asia Minor, but Artaxerxes by bribery succeeded in engaging a Grecian war against Sparta. Agesilaus was recalled to the defence of his country, and the Persians soon afterwards gained a naval victory near Cnidus, principally by the assistance of Conon the Athenian, B.C. 394. The Spartans were at last induced to sign the treaty of Antalcidas, which gave up everything for which they had been contending, B.C. 394. [See AGESILAUS.] Cyprus did not submit [see EVAGORAS], and it required more than ten years to reduce it to subjection. Artaxerxes conducted in person a war against the Cadusii, a people inhabiting the mountains on the west and south-west side of the Caspian Sea, and he exhibited a patience under fatigue which astonished his courtiers. He married his own daughter, Amestris and Atossa, the first example in Persian history of such an unnatural alliance. Towards the latter years of his life he put his son Darius to death in consequence of a conspiracy which he had formed against him. He died from grief on account of the bad conduct of Ochus, the youngest of his sons, B.C. 359, at the age of ninety-four, and was succeeded by Ochus.

(Plutarch's "Life of Artaxerxes;" Diodorus, lib. xiii. xiv.; Ctesias; Xenophon's "Anabasis.")

ARTAXERXES, called Ochus before he ascended the throne, was the third son of Artaxerxes Mneion. He began his reign by putting to death all those of the royal family from whom he thought himself likely to incur danger. Egypt, which never quietly submitted to the sway of the Persians, was at this time in revolt, and governed by the last of its native princes, Nectanebus II. Artaxerxes led a powerful army against him, and completely broke the strength of Egypt, B.C. 354. He was assassinated by Bagas, his favourite eunuch, an Egyptian by birth, B.C. 338, who placed on the throne Arses, the youngest son of Ochus. (Diodorus, lib. xvi. xvii.; Justin, x. 3; Plutarch's "Agesilaus.")

ARTAXERXES (Artah-shir), the founder of the dynasty of the Sassanidae, kings of Persia, reigned from A.D. 226 to 240. He was grandson of a certain Sassan, whence the dynastic title. Artaxerxes had served under Artabanus, king of Parthia, but took advantage of Parthia's weakness, after her long struggle with Rome, to regain the freedom of Persia after 175 years of subjection. He asserted that he was a descendant of the great race of Cyrus, the ancient kings of Persia, and added to the prestige thus gained a fanatic devotion to the worship of the according to Zoroaster (Zerdusht). Artaxerxes exterminated the royal race of Parthia, and then demanded of Rome the restoration of all the ancient dominions of Persia, but was not powerful enough to enforce his demand; and after a contest of ten years, peace was agreed to on the terms of the *status quo ante bellum*. For the successors of Artaxerxes see **SASSANIDES**.

ARTEDI, PETER, a distinguished naturalist, was born 22nd February, 1705, at Åmnd, in Angermanland, Sweden. In 1721 he went to the University of Upsal, and formed a close friendship with Linnaeus. They worked together heartily, the study of fishes and the amphibious being assigned to Artedi, while Linnaeus devoted himself to birds and insects. In testimony of their friendship, before the departure of Linnaeus for Lapland and Artedi for England, each constituted the other heir to his papers and collections of natural history.

In September, 1734, Artedi went to London, where he met with the most courteous reception, particularly from Sir Hans Sloane. During his stay in London he wrote the preface to his "Ichthyologia." At this time Albert Seba, an old and wealthy apothecary of Amsterdam, who had collected an unvalued museum of objects of natural history, had published two volumes descriptive of quadrupeds and serpents, and when about to publish the third concerning fishes, he requested the assistance of Linnaeus. He, being occupied with other matters, declined Seba's offer, but recommended his friend Artedi, who drew up for the work of Seba the descriptions of the remaining part of his museum (1735).

When Linnaeus had finished his "Fundamenta Botanica," he hastened to Amsterdam to show it to Artedi, who on his part showed Linnaeus his "Philosophia Ichthyologica," which had been the work of several years' labour. This delightful and advantageous interchange of ideas soon experienced a melancholy interruption; Artedi, on the 21st September, 1735, when returning to his lodgings from the house of Seba, fell into one of the canals of Amsterdam and was drowned.

Linnaeus, in conformity with their testamentary arrangement, claimed his manuscripts; but the landlord, on account of some small debts, refused to give them up. They were purchased by Dr. Clifford, and by him presented to Linnaeus. Among them he found the "Philosophia Ichthyologica" alone finished; the "Synonymologia," a work of immense labour, complete, but confused. Linnaeus devoted more than a year to render these works complete.

and then gave them to the world, preceded by a well-written life of the author, in one vol. 8vo (Leyden, 1738). Linnæus had previously availed himself of them for the department of fishes, as also of some work of Artdi's on umbelliferous plants, in his "Systema Naturæ," published at Leyden in 1735.

ARTEMIDORUS of Ephesus wrote a treatise on general geography, in eleven books. He wrote probably about the first century B.C. His geographical work is very often quoted by Strabo, by Pliny, in his "Natural History," and by Stephans of Byzantium. The passages thus quoted are collected in Hudson's "Minor Greek Geographers," vol. i.

ARTEMIS, one of the twelve Olympian deities of the Greeks. The goddess **DIANA** of the Romans was invested by them, after their usual manner, with the attributes of Artemis. In the Greek mythology Artemis is the daughter of **LEO**, who bore to Zeus her and her brother Apollo at one birth, in the island of Delos. She is goddess of the moon, just as Apollo, her brother, is god of the sun; and is not to be confused with Selene, the mere personification of the moon, any more than Apollo with the purely sun-god Helios. Selene fell in love with the sleeping shepherd Endymion, and descending to earth kissed him as he lay; but such a legend is quite inappropriate to the chaste virgin-goddess Artemis, although often attributed to her.

In her capacity as sister of Apollo, Artemis shares his mastery of the bow, his power of inflicting sudden death, his protection of vegetation (the cool night dews being of priceless value in the sultry summer-tide of the south), and his care to ward off evil from men. She was represented as fond of

roaming through the woods in pursuit of game—her favourite quarry being a stag. As befitting the goddess of the pale pure moon, Artemis fiercely resented any immodesty. She caused Actæon to be torn by his own dogs, because he saw her bathing; and she slew **ORION**, the hunter, who dared to pursue her.

Her surveillance of her own nymphs was most rigid, and her unrelenting severity towards those who broke their maiden vows forms the basis of many myths. [See **CALISTO**.] The myths of **NIOME**, **HIPPOLYTUS**, **ARLPHUS**, **ALAIANA**, **MELLAGER**, and **IPHIGENIA**, are among the most celebrated in connection with the goddess.

Artemis was a favourite subject with the artists of Greece, and they have generally represented her as a huntress. In the works of Scopas, Praxiteles, and Timotheus, Artemis was represented of a slender form; her hips and breasts without the fullness of womanhood. The countenance is that of Apollo, only with a softer expression and more full; the hair is sometimes bound over the forehead, but more frequently in a bunch behind or on the top of the head in a manner peculiar to the Dorians. The dress is a Doric vest, tucked up high to free the limbs for running; the leg below the knee is protected with some embroidered covering, and the shoes are Cretan. Sometimes a dead or dying stag lies at her feet. One of the most celebrated statues of the goddess is the so-called *Diana à la biche* of the Louvre, Paris; which ranks as one of the finest bronzes extant, and is a noble piece of the antique.

The *Taurion Artemis* has little but the name in common with the Greek goddess. The divinity of Tauris is a sanguinary being, delighting in sacrifices even of men; so that all strangers who were wrecked on this inhospitable land were sacrificed to her. [See **IPHIGENIA**, **ORFESTES**.] Tauris is the modern Chios. When the image of the strange and Artemis was brought to Athens and worshipped under the name of Artemis Brauronia (the place where the image landed), says, were secured at her altars till they bled, but the heathen sacrifices were abolished.

Yet another quite distinct goddess of the same name is

the *Ephesian Artemis*—the "Diana of the Ephesians" of the Acts of the Apostles. (The Greek Testament has of course Artemis, and not the Latin name Diana wrongly used by the translators). Many readers and spectators of Tennyson's play, "The Cup," were astonished at finding the Artemis served by the priestess Camma represented in so monstrous a fashion. No longer the bright, swift-footed, virgin huntress, but an Eastern idol occupies the shrine, swathed, except as to the naked feet, up to the waist in tight bands which are covered with ornaments of strange beasts; her chest, left bare, is covered with countless breasts, an embroidered collar surrounds her neck, and her head bears a tall crown; lions cling to her arms; the full moon extends as an aureole behind her head and bust. The temple of this horrible idol at Ephesus was one of the "seven wonders of the world." On the night of the birth of Alexander the Great it was burned by an incendiary; and the monarch regarded this as having been a favourable omen, so that he rebuilt it in the full tide of his success, and it was more splendid than before. The silversmiths of the place copied the front of this temple to make small shrines; and it was "a certain man named Demetrius, a silversmith, which made silver shrines of Artemis, and brought no small gain unto the craftsmen," who raised that tumult which brought the lives of Paul and his friends into such great danger (Acts xix.). The old translation "silver shrines for Diana" (Artemis) is not correct.

As goddess of the moon Artemis is represented wearing a long robe reaching to the feet, the head covered with a veil, and bearing the crescent moon—the expression of the face very calm and noble.

ARTEMISIA, an extensive genus of plants belonging to the **COMPOSITE**, and remarkable for the intense bitter, coarse cottony of its species. It is easily recognized by the large number of fine divisions into which its leaves are usually cut, and the numerous clusters of small, round, drooping flowers, which are yellow, or brownish flowered with white.

The *Artemisia* of the ancients, *Artemisia vulgaris*, is a Siberian species, with broad, smooth, and rather succulent leaves; but the narrow, deeply lobed leaves, which are so common in the south of Europe, and which are employed in medicine, are of the *Artemisia* *absinthium*, and as an ingredient in some kinds of wine.

Southernwood (*Artemisia Abrotanum*) is an odoriferous herb found all over the south of Europe from Portugal to the Dardanelles, and thence through Palestine, Persia, and the middle of Asia to China. The leaves have very narrow segments, downy underneath, and have distinct stalks. It is used on the Continent in making beer, and is frequently seen in old-fashioned gardens, where it was cultivated for its peculiar aromatic scent.

Wormwood (*Artemisia Absinthium*) is an indigenous perennial plant. The leaves are covered with a silky down, and are cut into many deep segments. This plant is met with on waste places, but that which is required for medical use is mostly cultivated. The upper part of the stem, with the leaves and unexpanded flowers, should be collected for these parts possess the peculiar aroma, with a strong bitter taste; while the lower part of the stem is merely aromatic, and devoid of bitterness. Wormwood possesses the properties common to aromatic bitters, and also some peculiar ones rendering it worthy of more attention than it receives. The bitter principle is readily absorbed, so that the flesh of animals fed upon it becomes manifestly bitter. Ale in which wormwood has been steeped (pur) is more heady than other ale. Absinthium greatly increases the appetite, and promotes digestion, particularly in

torpid systems and debilitated constitutions. Those who by excess have impaired their stomachs have recourse to wormwood to renovate their powers. Hence the demand among gourmands for the spirituous preparations, such as the *crème d'absinthe*.

ART'ERY (from the Greek *arteria*, signifying an air-vessel, because the ancients, ignorant of the circulation, and finding the greater arteries always empty after death, supposed they were tubes containing air). By the term artery is meant a vessel which conveys blood from the heart to the different parts of the body; a vein, on the contrary, is a vessel which conveys blood from the different parts of the body to the heart. All the arteries of the system proceed from two great trunks immediately connected with the cavities of the heart, viz. the pulmonary artery, which arises from the right ventricle of the heart; and the aorta, which springs from the left ventricle. The pulmonary artery conveys blood from the right ventricle of the heart to the lungs; the blood returning to the heart after respiration, by the pulmonary vein, is then carried by the aorta, from the left ventricle of the heart to all the parts of the system, and consequently the aorta is the common source of all the arteries of the body, with the exception of those which circulate through the lungs. The arteries derived from the aorta contain scarlet arterial blood, those derived from the pulmonary artery contain dark venous blood, and this latter vessel is the only artery in the system which does not contain arterial, that is, oxygenated nutrient blood.

The arterial system is arborescent, the arterial trunk always dividing into branches, and the larger branches into branches more and more minute; the arterial system is always larger in proportion to the size of the animal. This is illustrated in the following diagram. The heart has been removed, and the aorta therefore has a cut end; it joins the heart. The pulmonary artery and vein, for the same reason, are not shown.

The smaller arteries and veins have rather thicker walls than the larger vessels. These latter are permeable to fluids, and the function of the capillaries is to be nourished; but the function of the arteries is to supply blood to the capillaries, and the function of the veins is to receive blood from them respectively, therefore the arteries are firmer, lest too much blood escape by the way, and the fibres of these walls are transversely placed, enclosing the vessel, and having power to lessen its calibre. The organization of the larger arteries differs considerably from that of the larger veins. Large arteries are of a yellowish-white colour, and are composed of three distinct membranes, which are superimposed one upon the other, and which are intimately united by delicate cellular tissue. Each of these membranes is called a tunic or coat, and each possesses a peculiar structure, and performs a separate function in the circulation of the blood. 1. The internal tunic consists of a membrane, colourless, transparent, and thin, yet so firm and strong that it is supposed to resist more than any of the others the bursting of the artery by the current of the blood. 2. The middle tunic, called also the "fibrous" and the "muscular," is composed of yellowish fibres, which pass in an oblique direction around the calibre of the vessel, forming segments of circles which are so joined as to produce complete rings. This coat is firm, solid, and highly elastic. The characteristic of this coat is contractility. If it be mechanically irritated, or if a chemical stimulant, such as ardent spirit or ammonia, be applied to it, the vessel contracts forcibly upon its contents. 3. The external tunic, called also the "cellular," consists of small

whitish fibres, very dense and tough, interlaced together in every direction, and so elastic that if a large artery is pulled out and let go, it stretches and returns to its primitive dimensions almost like a piece of india-rubber. It is much thicker in the large trunks than in the small branches, the reverse holding good of the muscular coat. The outer surface is covered by a loose and flocculent cellular substance, which connects the artery with the surrounding parts, and particularly with the sheath of the vessel. Its firmness and resistance are so great that it is not divided, however firmly a ligature may be placed around the artery.

The most important property of arteries is their contractility, that is, their power of diminishing their capacity or approximating their walls (parietes), and thus proportionally acting upon their contents. Even the large trunks possess this property in some degree; but it resides chiefly in the ultimate divisions of the arterial branches, that is, those which immediately supply the capillary vessels, so that the flow of blood may be thoroughly controlled.

The larger veins, on the other hand, contain but little of either elastic or muscular tissue. Hence their walls are thin; and they collapse when empty, which arteries do not. Another distinction of arteries is the absence of those valves or pouch-like folds of the inner surface which in the veins prevent a reverse current of blood. The aorta and pulmonary artery have valves when they join the heart, but the action of these will be best considered in treating of that organ.

The varying capacity of the arteries, as a whole, is remarkable. Whenever an artery divides, its branches are collectively larger than the branch from which they spring, and so the entire arterial capacity grows regularly greater and greater as the distance from the heart increases, until the capacity of the capillaries is 800 times that of the aorta (Vierordt). The same fact holds good of the veins; but, as between arteries and veins, we find the united capacity of the two great veins which discharge the whole venous blood into the heart is nearly double that of the aorta which receives the whole arterial blood from the heart, and further, the whole area of the veins is so much greater than that of the arteries that one section of the veins (the portal veins) could by itself hold all the blood in the body, both arterial and venous, if distended.

The flow of blood in the arteries is not even, but by jets which correspond to the heart-beats, though the flow does not cease between the jets. The force of the jet diminishes as the area of the flow increases by the collective increase of the arterial capacity with the distance from the heart, explained above. In the great vessels it is considerable; thus Dr. Hales ("Statistical Essays") found in his experiments on the subject, that the blood was expelled to a height of 2 feet when the crural artery of a horse was pierced. The arteries are therefore manifestly always *over-full*, always at high pressure; the veins at much less pressure being not nearly so full, and the striving of the elastic arteries to equalize the pressure and discharge their surplus blood, is the great cause of the capillary circulation. When the heart ceases to beat the arteries succeed in emptying their surplus blood into the veins, and the capillary circulation ceases. It has been said above that the area of the two great final veins (venæ cavæ) is nearly double that of the single main artery, the aorta; and since it is manifest that as much blood must pass out of the heart as passes into it, at each stroke, the flow of blood must be nearly twice as rapid in the aorta as in the venæ cavæ. For other facts as to arteries see ANEURISM, HEART, CIRCULATION OF THE BLOOD, AORTA, &c.

ARTESIAN WELLS are perpendicular perforations or borings, through which water rises from various depths, according to circumstances, above the surface of the soil. Such perforations have been named Artesian wells, from

having been first used in the district of Artois in France. They are seldom more than a few inches in diameter, and are made by means of the usual boring instruments. Their action is due to the constant endeavour of water to seek its level, as will be readily understood by means of the accompanying diagram. The rain which falls on the porous stratum *b b* (where it lies above ground) collects therein—it cannot sink through the rock, *c*, which we will suppose is impervious to water, and it cannot rise through the clay, *a a*, to supply the town. *T*. If now the dwellers in the town bore an Artesian well through *a a* into *b b*, it is as if a great bent pipe full of water were tapped, the



effect of which we know would be to cause a jet to rise almost to the level of the water in the ends of such a pipe.

Many Artesian wells exist in London and its vicinity; those which form the ornamental fountains in Trafalgar Square descend into the upper chalk of the London Basin to a depth of nearly 400 feet. Many of the London breweries derive their water from Artesian wells. The Bank of England is thus supplied, as are also the Pentonville Prison, Colney Hatch Asylum, the Euston Station, Holloway Prison, &c. In fact, the general level to which the water rises in the London district has been very sensibly lowered by the immense number of perforations that have been made; and in several wells where the water formerly rose to the surface, it now stands considerably below it, and has to be pumped up. None of the Artesian borings in England approach the depth and extent of those on the Continent and in America. There is a famous Artesian well at Grenelle, on the outskirts of Paris, where the water is brought from a depth of 1798 feet, at the rate of 516 gallons a minute, is raised with such force as to be propelled 32 feet above the surface, and comes up at a temperature of 82° Fahr. That at Passy, near Paris, supplied from the same water-strata as that of Grenelle, throws up from a depth of 1923 feet a stream of water at the rate of 5582,000 gallons per day to a height of 54 feet above the ground. At Kissingen, in Bavaria, an Artesian well was opened in 1852 which had been twenty years in making. The water issues from the soil with a temperature of 66° Fahr., at the rate of 100 cubic feet per minute. The borings reached two saline springs, and then descended to a bed of solid rock-salt at the depth of nearly 2000 feet. At St. Louis, Missouri, a boring was carried down to a depth of 3147 feet in 1868; but as only brine was obtained the works were stopped. The deepest boring in the world is at Sperenberg, 20 miles from Berlin, having been sunk to obtain a supply of salt. At a depth of about 250 feet the salt bed began, and the boring was continued to the extraordinary depth of 4194 feet, without even then piercing entirely through the salt deposit. Artesian wells have been productive of much use in the dry and arid districts of Algeria; and there seems reason to believe that some day the deserts of Africa may by their means be converted into fertile plains. Artesian wells are of the greatest possible value in determining the geological order and depth of strata, increase of temperature with depth, &c.

ARTEVELD, JACOB, a brewer of Ghent, and a great popular leader in the early part of the fourteenth century. The war of the French succession, which broke out between Philip VI. of France and Edward III. of England, gave occasion to a revolt of the Flemish towns. Ghent took the lead, and the burghers elected for their captain Jacob Arteveld. Active, eloquent, and bold, but violent, overbearing, and tyrannical, Arteveld proposed, during the

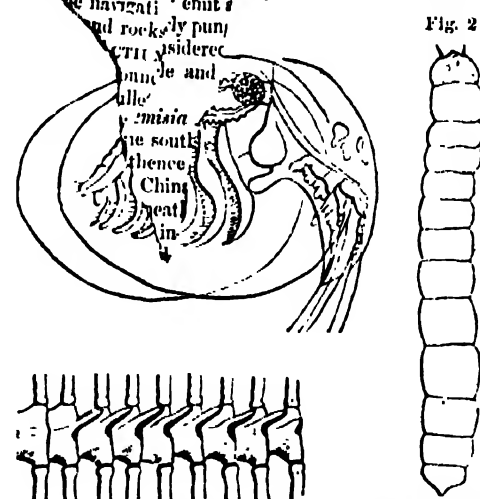
course of the war, that Edward's son, the young Prince of Wales, afterwards called the Black Prince, should be elected governor of Flanders, on the understanding that the country was to be made by Edward a sovereign duchy. A dispute broke out at Ghent between the various trades. Arteveld secretly introduced into Ghent 500 English soldiers, whom he lodged in his premises. The trades rose, attacked Arteveld, and killed him, with many of his English soldiers, in July, 1344. Arteveld's authority in Flanders had lasted altogether seven years.

ARTEVELD, PHILIP VAN, was the son of Jacob Arteveld. He married young, and lived quiet and happy with his wife and mother, keeping aloof from all public affairs. But during the siege of Ghent in 1381, after a fresh revolt against Count Louis of Flanders had broken out, Van Arteveld was elected captain by acclamation. When it was impossible to hold out any longer for want of provisions, he conceived the bold resolution of marching out with a chosen body of men and attacking Count Louis de Male, who was then at Bruges. He left Ghent on the 2nd of May, 1382, with 5000 men, determined to conquer or to die, and halted in a good position, within 3 miles of Bruges, where the next day the count and the forces of Bruges were utterly defeated.

After the capture of Bruges, the other towns of Flanders, with the exception of Oudenarde, opened their gates to Arteveld. But the King of France (Charles VI.) sending an army to the help of the Count de Male, Van Arteveld and 25,000 Flemings perished at Roosebeke, near Courtray, in the following November.

(Barante, "Histoire des Ducs de Bourgogne de la Maison de Valois.")

ARTHROPODY or **ARTHRON**, a joint; and **POUS**, a foot) is one of the subphyla of the animal kingdom. These vertebrates agree with fishes in having a body made up of a number of segments, but differ from them in having the segments articulated more or less into segments, e.g. in insects. So is a cephalic (head) region, a thorax, and an abdomen, each consisting of several segments. They are also characterized by the presence of jointed limbs, and by the presence of a nervous system. Figs. 1, 2, 4 illustrate the structure of the body and limbs of an arthropod.



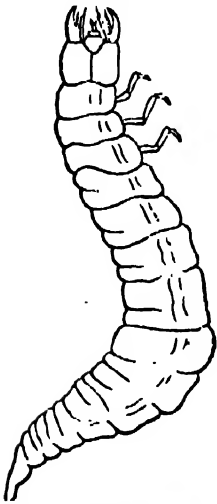
One of the Entomostracous crustacea, showing very clearly annulose structure.

Larva of a Beetle, showing the annulose structure.

ringed or "annulose" body and jointed limbs of Arthropoda. The skin is generally hardened by carbonate of lime, or a horny substance called *chitine*, and the muscles are attached to the inner surface of this hard case, thus supplying the place of an internal skeleton. The nervous system

typically consists of two cords passing along the ventral side of the body, with a pair of nerve-knots (ganglia) in each somite; but here again there is a higher development than in Vermes, as the ganglia tend to become pushed forward towards the head. The blood-circulatory system, when

Fig. 3.

LARVA of *Hydrous piceus*.

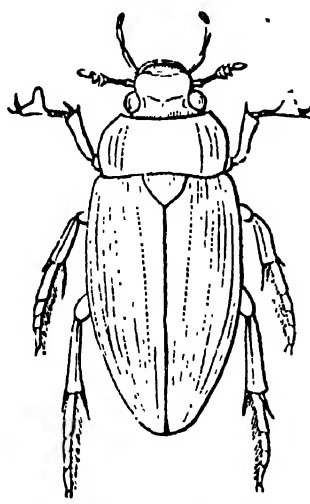
present, is placed on the dorsal furnished with a heart.

There are four classes—the C of antennæ and more than four NYDA (with no antennæ or MYRIAPODA (with one pair legs), the INSECTA (with our pairs of legs).

ARTHUR. We shall divide the first comprising those part celebrated British chief which a evidence; the second giving a sl of fiction concerning him which of our national literatr re.

He was a prince of the tribe according to the common story the Pendragon (Dragon's-head), a title to an elective sovereign over the many kings of The date of Arthur's birth, or even of his accession to his paternal inheritance, it is vain to inquire. He appears to have commenced his martial career about the year 500, and was raised to the Pendragonship, according to Owen, in 517; according to Whitaker, in 508. Nennius asserts that he gained twelve victories over the Saxons. Of these, eleven are asserted by Whitaker ("Hist. of Manchester," vol. ii. chap. 2), with reasons of great plausibility, to have been fought in Lancashire, or still further to the north, at a period anterior to his election to the Pendragonship. The last and most important of these battles, that of Badon (placed by Whitaker at Badby in Wiltshire, by Camden and Turner at Bath, by Carto in Berkshire), checked the progress of Ceride, and compelled him to content himself with those provinces along the south coast which he had already gained; from which Arthur is not recorded to have tried to expel him. The date of this is variously placed. Whitaker, following Matt. West., says 520, which a doubtful passage in Gildas seems to confirm. From this time we hear no more of Arthur until the revolt of his nephew, Modred or Medrod, which led to the fatal battle of Camlan in Cornwall, in 542. Modred was slain and Arthur, mortally wounded, was con-

Fig. 4.

Ima of *Hydrous piceus*.

to body, and is

(with two pairs of legs), the ARACHNIDS (with two pairs of legs), the INSECTA (with four pairs of legs), the MYRIAPODA (with one pair of legs), the NYDA (with no antennæ or more than four pairs of legs).

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Uther, named

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The last and

most important

of these battles,

veyed by sea to Glastonbury, where he died and was buried. Tradition preserved the memory of the place of his interment within the abbey, as we are told by Giraldus Cambrensis, who was present when the grave was opened by command of Henry II., and saw the bones and sword of the king, and a leaden cross let into his tombstone, with the inscription in rude Roman letters "Hic jacet sepultus inclitus Rex Arturius, in insula Avalonia," as seen by Leland, and copied from an attested copy by Camden. A popular traditional belief was long entertained among the Britons that he was not dead, but had been carried off to be healed of his wounds in Fairyland, and that he would reappear to avenge his countrymen, and reinstate them in the sovereignty of Britain.

The Arthur of romance is a very different person. He is the son of Uther Pendragon by Igerna, wife of Gorlois, duke of Cornwall, and owed his birth to a magical device, by which Uther assumed the form of the lady's husband. He succeeded to his father when fifteen years old, and immediately prosecuted hostilities against the Saxons in the north of England, whom he defeated in many battles. After that of Mount Badon he hastened to Scotland, to relieve Dumbarton (Alcluyd), besieged by the Scots and Picts. Having done this, he returned southwards, kept his Christmas at York, and employed himself in destroying the pagan temples of the Saxons and restoring the Christian churches. The following summer he conquered Ireland and Iceland, and then returned to Britain, where he spent twelve years in peace. We need not dwell on his foreign conquests of Norway and Gaul, which occupied ten years more. He then returned to England, and held a great festival at Caerleon in Monmouthshire, where he was solemnly crowned, a multitude of tributary kings attending him. Not long after the Romans demanded tribute, on which he collected a mighty army and passed into Gaul. There he defeated the Romans, and was preparing to cross the Alps, when he received intelligence of the revolt of Modred, who had allied himself with the Saxons, Scots, and Picts. Arthur gained two victories, one on the coast of Kent and one near Winchester, and forced Modred to fly into Cornwall, where a third engagement, fatal to both, was fought on the river Camlan.

Such is the story told by Geoffrey of Monmouth, and much later by Buchanan ("Historia Scotica"), and adopted with all manner of additional fiction by the romancers. The island abounds with memorials of the fame of Arthur, whether he be a real or imaginary person. We have Arthur's Seat; Arthur's Round Table, in more than one place; Arthur's Castle; the Welsh call the constellation Lyr, Arthur's Harp (*Telyn Arthur*); and the principality abounds in monuments of art or nature which bear his name.

("History of the Anglo-Saxons," by Sharon Turner; Whitaker's "History of Manchester;" Warton's "History of English Poetry," for the work of Geoffrey and the romances; Ellis' "Specimens of Early English Metrical Romances;" and Dunlop's "History of Fiction." Mr. Tennyson has illustrated, in matchless verse, all the most famous legends of Arthur. His "Idylls of the King" indeed almost amount to an Arthurian epic.)

ARTHUR'S SEAT. See EDINBURGH.

ARTICHOKE (*Cynara Scolymus*) is a plant belonging to the order COMPOSITÆ. The genus *Cynara* is characterized by having a fleshy involucre, with emarginate, hard-pointed bracts; a very fleshy receptacle with hair-like paleæ; and a four-cornered, hard, smooth fruit, with an oblique scar. The artichoke is a perennial, growing from 4 to 6 feet high, with some resemblance to a thistle. The

leaves are spiny. The flowers are purple, seated on the receptacle, which is known as the "bottom," and surrounded by the ovate scales of the involucre. The artichoke came originally from the south of Europe, and though it has long been cultivated in the regions of the north it does not resist the very severe cold of winter. The root of the artichoke is rather bitter, the stem still more so. It was formerly employed as a diuretic, but it has long been cultivated only as a kitchen-garden plant. The artichoke when cooked is an agreeable food, not very nourishing perhaps, but easy to digest. The eatable portion consists of the "bottoms," cleared from the bristles and scales—the "choke." It has been introduced into the pampas of South America, and has there spread to such an extent that, when in flower, whole regions are quite impenetrable. The fancied resemblance in flavour of the tubers of *Helianthus tuberosus* to the artichoke has led to its being called the JERUSALEM ARTICHOKE. This plant is, however, a sunflower (Ital. *girasole*), whence its popularly corrupted name.

ARTICLE is the name given by some grammarians to the two little adjectives *the* and *an* in the English language, and to words of like import in other modern languages, the former being called the definite, the latter the indefinite article. We do not attempt a more philosophical definition, because the separation of these words from the other adjectives of language, whether pronouns or not, appears to depend upon a no very accurate principle; and the distribution of the parts of speech would perhaps not be the less philosophical if the so-called articles were restored to their proper place. The indefinite article *an* is only a by-form of the numeral adjective *one*, or, as our ancestors wrote it, *ane*; and *a* is but a corruption of *an*. Thus in German even now *ein* is at once equivalent to our *one* and to our *an*. In the same way the French *un*, Italian *uno*, Spanish *uno*, &c., are evidently derived from the Latin form of the same numeral, *unus*. (The Aryan root is $\sqrt{\text{AINA}}$, whence Greek *oios*, Latin *unus*, Gaelic *aon*, Saxon *an*, old English *aan*, English *one*.)

On the other hand the definite article *the* will appear, on the slightest consideration, to be a corrupted demonstrative pronoun. In fact, as it stands it is simply the masculine of the Saxon demonstrative pronoun. The term *arthron* (*arthron*), a joint, was invented by the Greek grammarians, but as used by them it is only applied to the definite article, and also to what, by modern grammarians, is called emphatically the relative (*ortho*). Our word "article" is only the Latin form (*articulus*) answering to the Greek word; and indeed in our word "articulation" (in anatomy) it retains its original sense of "joint." We often find a repetition of the defining particle, as, "I gave you *the* book which you asked for," or, what is equally good, except in rhythm, "I gave you *that* book *that* you asked for." It was from the contemplation of such a sentence as this that the Greeks considered the defining particles as performing the office of joints which connect the two propositions together; and to distinguish the one article from the other, that which precedes the noun was called the *prepositive* article, and that which follows it the *postpositive* article. The qualifying terms are perhaps not very well chosen, but undoubtedly the term "article" is very expressive of these relative particles, which in all cases, or nearly so, do perform the duty of connecting two propositions together; and hence we ought not to be surprised that a large proportion of the conjunctions have their origin in the relatives or demonstratives. In Homer the article does not yet appear, or if it may be held to appear in some cases, these are very few; in Herodotus the same element performs at times all the three offices; and as we descend chronologically we find the tragedians still confounding the diverging forms of the relative and article. In fact modern grammars usually treat of the

Greek article under the three heads—1, of the article; 2, of the article as a demonstrative pronoun; 3, of the article for the pronoun relative.

In the same way the German *der*, of which the *de* only is radical, is at once demonstrative, relative, and definite article. So completely does the German agree with the Greek that *der*, which often throws off much of its demonstrative power to play the part of the mere article, has a kind of double in *dieser*, for the pure demonstrative, just as *obus* doubles *is* with the same meaning in Greek. And lastly, the English philologist will find the same threefold power among the derivatives from the English allied root *the*, viz. among the forms *this*, *that*, *then*, *than* (compare the use of the Latin *quam*), *there*, *thence*, *the*, &c. The form *that* is still retained, as was before observed, with the power of the relative; but in the older writers *there*, *thence*, &c., were also freely used where we now only employ *where*, *whence*, &c.

The Latins had no indefinite article (unless the use of *quidam* be held to constitute one), and but an imperfect makeshift for a definite article. For the latter purpose they used the pronouns *hic*, *ille*, *is*; and the definite articles or demonstrative pronouns of the modern languages which have been derived from the Latin are all referable to the Latin demonstrative *ille*, *illa*, as the French *il*, *la*, &c.

In most modern English grammars the old description of the article as a separate part of speech is discarded, *a* or *an* being treated as numeral adjectives, and *the* as a demonstrative adjective.

Etymologically *the* and *that* are simply the Anglo-Saxon demonstrative pronoun δ , *deo*, *dat*. (It is true that *se* and *seo* are gendered in Saxon for the masculine and feminine, but *the* are reported forms, the original being given above.) δ corresponds to Saxon δ is our *th*, therefore the article or pronoun *the*, *thet*, as spoken. We say *the* man, the *th* altogether; the Saxons said "the man" (or *se* man) were *wide*, altering the article to agree with the neuter noun *wide* about 800 years ago. The same Saxon phrase ("the man, the book") would be for our "that man, that book," since *th* in article thus for pronoun were (like the Latin referred to above). The suffix *t* in the Saxon is merely *th* in article, *thet* gender, like the Latin *t* in *id*, *illud*, *istud*. We have English *the*, *that*, from Anglo-Saxon *the*, the navigation and this from the ancient Teutonic base *tha*, we and rocks, Germanic form of the Aryan root $\sqrt{\text{TA}}$, meaning *that*, the Sanskrit form being *tat*. The Greek τ is the neuter of the definite article; and the Latin *t* multi for all three genders (*te*, *ta*, *tud*), as shown in *is-te*, *is-tud*, the *d* being merely the neuter suffix, as explained above. This little word serves powerfully, therefore, to enforce the great theory whereby we trace our descent to our ARYAN progenitors, and our fellowship with all the great peoples of the world save only Jews, Turks, and Chinese.

ARTICLES OF THE CHURCH OF ENGLAND.

See THIRTY-NINE ARTICLES.

ARTICLES OF THE PEACE, a term applied to a record taken upon oath upon which a recognizance or obligation to the king is entered into whereby the parties acknowledge themselves to be indebted to the crown in the sum required, with condition to be void and of none effect if the party shall appear in court on such a day, and in the meantime shall keep the peace. (Blackstone, "Comm." iv. ch. 18; Burn's "Justice.")

ARTICLES OF WAR. See ARMY, BRITISH.

ARTICULATA, or ARTICULATED ANIMALS, Cuvier's third great section of the animal kingdom, comprehended the Annelida, the Myriapoda, the Insecta, the Arachnida, and the Crustacea. The class Annelida is now put under the subkingdom VERMES; the other four classes constitute the subkingdom ARTHROPODA.

ARTICULATION, the term by which anatomists express the union of the different bones of the skeleton. The junction of any two bones, however firmly or loosely connected, or in whatever mode the union may be effected, is designated by the name of articulation. Commonly two substances are employed as the media by which the connection is established, namely a firm and strong membranous tissue, known under the name of ligament, which may be considered as the band by which the bones are tied together, and a peculiar substance termed cartilage or gristle [see **CARTILAGE**], which is often interposed between the surfaces of the bones to be united, and which, besides serving as the bond of union, accomplishes other purposes. Some bones of this class are so firmly united that they admit either of no motion whatever, or only of a very slight degree of it, the union being effected sometimes by the apposition of the surfaces of strong and flat bones, at other times by the formation of numerous prominences and depressions which mutually receive each other; examples of both these modes of union are found in the articulation of the bones of the head and face. *Suture* is the term given to this mode of union, when the bones are firmly impacted into each other by indentations like the teeth of a saw; and the bones of the cranium are nicely adjusted and firmly united to each other in this manner. At other times a ridge is formed in one bone which is received into a groove fissured in another. The bony part of the septum which divides the nostrils affords a specimen of this mode of union, while the teeth are secured in their sockets—that is, a conical surface is firmly impacted in a cavity—very much as a nail is fixed in a board.

Joints or articulations may be perfect or imperfect. Imperfect articulations are united by ligaments, and are less than the flexibility of the connexion. The articulation of the vertebrae, or example of imperfect articular column of fishes and of a [see **ARCHILOPTERYX**] the which are biconcave and connected with the gelatinous remains of a kind of ball-and-socket joint is rendered the vertebral column of a reptile with that of other Vertebrae.

Perfect articulations, on the other hand, are those in which the surfaces of the bones are adapted to each other, the convexities of the one fitting into the concavities of the other. The shoulder bone articulates with the arm, forming a ball-and-socket joint, and the elbow is a hinge-joint between the bones of the forearm and the arm (see **PLATE XXX**). Another example of perfect articulation is furnished by the pivot-joint between the atlas and the axis, the first vertebrae of the neck. See **ATLAS**.

ARTICULATION has another sense than that of the previous article, namely, the art of distinct pronunciation, the distinct and accurate enunciation of syllables in reading and singing, and the kindred art of clear production of well-defined tones on musical instruments. It is not too much to say that most amateur singers, by inattention to articulation, lose half the effect they would otherwise produce; and the universal custom of assisting the audience with "books of the words" has grown up from the inability to follow the meaning of the words as altered and marred for the convenience, or by the carelessness, of the singer. Similarly, a common practice with bad pianoforte players is to destroy articulation by continually holding down the damper-pedal. Great attention is now paid to articulation; and as regards the first part of our remarks the reader is referred for practical details to the exhaustive essay on "Speech in Song," by Alex. J. Ellis, F.R.S. (Novello, 1880).

ARTILLERY, in its oldest and most general sense, embraces all kinds of missiles and the engines employed in projecting them. The origin of the word is the old French *artiller*, to fortify. This comes from Lat. *artillare*, the assumed verb corresponding to the known substantive *artifactor*, a maker of machines, which latter arises from *arti*, the crude form of Lat. *ars*, *artia*, art or skill. In its modern application the term is used sometimes to designate the material, *guns*; or the *personnel* and organization by which the power of this arm is wielded.

The earliest military engines were in all probability those which are mentioned in 2 Chron. xxvi. 15, as in use about B.C. 1000, having been "invented by cunning men to be on the towers and upon the bulwarks, to shoot arrows and great stones withal." The names of the *ballista* or *ballista* (Plate I. fig. 1), which was employed for throwing stones, and the *catapulta* (figs. 2, 3), for throwing darts and arrows, imply a Greek origin, but ancient writers differ in their accounts of their invention. Both were much used in the Roman times; and Vegetius, in the fourth century, notices other similar engines under the names of *scorpion* (fig. 5), *areubolista*, *fustibula*, and *fundæ*. In addition to these might be named *battering-rams*, which consisted of a heavy beam headed with iron, slung in such a manner as to butt with destructive force against a wall or gate (figs. 6, 7); and *movable towers* (fig. 4). Such machines do not appear to have been used in England until the Norman invasion, and were used by the Normans chiefly in sea-fights, for throwing Greek fire, quicklime, and the combustibles, as well as stones and darts. Richard I. employed against the Saracens some such engines, worked by the force of the wind acting upon sails. Edward I. used engines at the siege of Stirling Castle, in 1303, which threw stones of 300 lbs.

The invention of gunpowder, though it did not for a long time supersede the ancient artillery, gradually brought about great changes in the art of war. Edward III. used cannon (then called "crakys of war") against the Scots in 1327, after which allusions to such artillery become frequent. The first cannon, which were called *bombards*, were very clumsy, wider at the mouth than the chamber, and formed of bars of iron bound together with hoops. The earliest cannon balls were of stone; and means, to manufacture projectiles from materials on the spot, accompanied an army on its march. *Hand-cannon*, carried by two men, and fired from a rest in the ground, were early used; and *carts of war*, conveying light artillery, are mentioned in a Scotch Act of Parliament in 1456. In the fifteenth century cannon of various shapes and sizes were generally much ornamented, and were distinguished by peculiar names, usually those of birds and serpents, such as the *falcon* and *falconet*, the *saker* (a kind of falcon), the *culverin* (from colubrine, a species of serpent), the *basilisk* (from the serpent of that name), and *serpentine*.

From Monstrelet and other authorities it would appear that cannon began to be formed by casting about the middle of the fifteenth century. Iron bullets (of which Monstrelet mentions one weighing 5 cwt.) began also to be used, but not to the exclusion of those of stone. A hard mixed metal, called *font-metal* or *bronze*, was early invented for the casting of cannon; and the casting of this kind of ordnance was commenced in England in 1535. In the sixteenth century the size of cannon was reduced, and they were made of superior form.

One of the largest cannon now existing is a brass one at Bejapoor, which was cast in commemoration of the capture of that place by the Emperor Akbar, in 1685. Its extreme length is 14 feet 1 inch; the diameter of its bore 2 feet 4 inches. An iron shot for this gun of proper size would weigh 1600 lbs.

For mortars we are indebted to workmen who were

employed by Henry VIII.; those made for him about 1543 being, according to Stowe, "at the mouth from 11 to 19 inches wide," and employed to throw hollow shot of cast-iron, filled like modern bombs with combustibles, and furnished with a fuse.

Of the various kinds of cannon, several of which are mentioned above, the *falcon* seems to have been of 2½ inches bore; the *demicalverin* of 4 inches bore; the *minion* of 3½ inches bore; the *culverin* of 5½ inches bore; and the *saker* of 3½ inches bore; the weight of the shot, however, not being in all cases proportionate to the bore. The *falconet*, *minion*, *falcon*, *saker*, and *demicalverin* were known respectively as 2, 3, 4, 6, and 9-pounders; while the heavier pieces, or *culverins*, ranged from 15-pounders up to the "Canon Royal," or 63-pounder.

Petards, which are explosive engines employed in sieges, were first used by the Huguenots in 1580. Red-hot balls were fired in the defence of Cherbourg in 1418, again at the siege of La Fere in 1580, and again in 1782 at Gibraltar. The *howitzer*, an improvement on the mortar, was first used in 1697; and the *carronade*, a kind of short cannon, or long howitzer, about 1799.

Military forces in the present day consist of infantry, cavalry, and artillery. The first and second divisions have figured in warfare from earliest historic times; but the third, as at present understood, is of much more recent origin; and an immense amount of ingenuity, skill, and experience have been required during a very long period to bring modern artillery to its present efficient state as a separate and powerful arm of the service. The successive steps by which the manufacture of guns of all kinds has arrived at its present perfection are described in our special article on these weapons. We here propose to deal more particularly with the growth, present position, and purpose of artillery as a military force.

The earliest organization of artillery in England was formed by Edward III., whose artillery train and ordnance establishment numbered 340 men, of whom, however, only twelve were termed artillerymen and gunners, the remainder consisting of wagoners, engineers, and artificers of various kinds. At the siege of Harfleur in 1415, Henry V. had an ordnance establishment which included twenty-five master gunners and fifty server gunners. Under his successor, Henry VI., it is recorded that in 1456 a commission was issued to one John Judd as "master of the ordnance," an office which existed close upon 400 years, not having been abolished until 1852. The duty of the master of the ordnance in earlier times was to take personal command of the artillery in expeditions and wars, and he was also responsible for the general administration of the *personnel* and *materiel* of the force. Henry VII. and Henry VIII. (1485-1546) did much to advance the progress of artillery; and during their reigns the unwieldy bombards were replaced by brass guns, the cumbrous beds upon which the earlier ordnance were transported gave way to rude artillery-carriages on wheels, and iron was substituted for stone in the manufacture of projectiles.

Artillery was first principally used in the attacks on castles and towns, the weights of the guns and the unwieldy construction of the carriages preventing them from being of much use in the field. Even when employed in the field, the moral effect produced by the noise would seem to have been of as much importance as the slow and inaccurate fire of the guns. Tartaglia, whose celebrated "Colloquies on the Art of Shooting," dedicated to Henry VIII., show him to have been in many respects a man of great talent and ingenuity, gives a receipt for causing "any great piece of artillery to make in his discharge an exceeding great noise, and a marvellous rore," which was to be accomplished by putting in a piece of lead or shoe-leather between the powder and wad, and a little quicksilver

through the touchhole. Artillery was clearly considered to be a mere adjunct and not a component part of an army; and the service of the guns was regarded as belonging to a mechanical rather than to the military science. Gunners were not attached permanently to an army, but were hired craftsmen—men who had served an apprenticeship to the art of firing cannon. After a course of practice in discharging different pieces at targets they obtained a certificate, and were then in a position to offer their services to princes of different states. They were well paid, and professed to keep their art secret. Charles V. issued an ordinance in 1519, forbidding cannoniers and artificers to teach without permission. Princes seldom maintained as many cannoniers as were necessary for a campaign, but borrowed them from foreign princes or towns. In addition to those who conducted the firing operations, numerous artificers were attached to the guns, to move, mount them, and effect repairs. For purposes of transport, horses, bullocks, and drivers were hired in the country in which the operations were being conducted.

When it first became usual for an army on the march to be accompanied by an artillery train, the latter was preceded by an advanced guard of cavalry to protect it. The first portion of this troop carried hatchets and saws; the second instruments and implements for the construction of machines; the third, sledge-hammers, iron wedges, and pick-axes; finally, the last were provided with pioneers' implements. After these came carriages loaded with guns, capstans, levers, and other like machines. They were followed by the light pieces, by the heavy siege guns, by ammunition wagons, by pontoons and the necessary men for them, by the *potill* of artificers, and lastly by the baggage. Artillery, even in the field of battle consisted simply in deploying guns, usually in advance of the line of troops, were widely fired a few rounds, but could seldom follow an out-maneuvring of the army. A further consequence of the use of the artillery train was that, if a retrograde movement became necessary, the guns and most of the train were lost.

Half a century later, but early the growing importance of artillery and consequently recognized, and the introduction of small-calibre guns on light carriages, and horsed so as to move with rapid movement, was the first step towards the formation of the rude and unwieldy trains of fort-bombards into distinct classes, each having an organization and equipment adapted for the particular service for which they were intended. Henry IV. of France, and Maurice of Orange, were prominent artillery reformers; but it was not until the great Swedish warrior, Gustavus Adolphus, that artillery began to take its true position on the battlefield. Recognizing the necessity of guns which could move quickly and fire rapidly, he used in the war with Poland some light pieces made of copper, strengthened with leather and coiled rope. This primitive field artillery, drawn and served by two men, could of course bear but a small charge; but the great point gained was mobility; and it was said that the king's victory at Leipzig, on 7th September, 1631, was "principally owing to the easy shifting and quick discharge of the newly-invented leather cannon." As a matter of fact, however, the famous "leather cannon" had been discarded, and Gustavus had entered upon his German campaigns with four-pounder guns weighing about 5½ cwt., and drawn by two horses. These pieces could fire three rounds, while the musket fired but one, a remarkable result which Gustavus obtained by the use of *cartridges*. The ordinary method of loading at that time being to insert the charge as loose powder by means of a ladle. Ladles, nevertheless, continued in use in other countries for at least 100 years afterwards, as by the Austrians at the battle of Mollwitz in 1741.

Gustavus Adolphus was also the first to thoroughly im-

corporate artillery with an army, which he did by attaching two guns to each regiment, and placing them under the orders of the colonel; and this system of regimental or battalion artillery prevailed until, after the Seven Years' War, it was superseded by the more powerful and complete organization of the *battery*. Gustavus, however, was fully alive to the value of concentration of fire, and frequently massed his guns in strong batteries at the centre and flanks. In the celebrated Thirty Years' War his artillery was often used with conspicuous and decided advantage, particularly at the battles of Leipzig (1631) and Lützen (1632). Before Frankfort he had 200 guns; he forced the passage of the Lech (1632) under the protection of 172 guns; and he took no less than seventy in his rapid march on Nuremberg.

The commencement of the Great Rebellion found artillery in England in a very feeble and backward state; and in no battles of this war did it assume the importance it had attained on the Continent. The English and Dutch brought howitzers into the field during the seventeenth century; and mortars were extensively used in sieges, but the manner of firing shells from them was primitive—one soldier lighting the fuse of the shell, and another firing the mortar. Hand grenades were first supplied to infantry, and explosive projectiles commenced to take part in all operations of war.

The experience gained in the great wars of the eighteenth century—viz. in that waged by the Duke of Marlborough and Prince Eugene against the French, in the Seven Years' War, and the wars of the French Revolution—led to the rapid growth of artillery in all its branches. The *matériel* was simplified and much improved, both as regards principles of construction and methods of manufacture; schools of instruction were established, and the organization and equipment were gradually modified until the adoption of the modern system, which presented possible the great results achieved with artillery by Napoleon and others during the present century.

In Marlborough's campaign, large numbers of guns were used on both sides, and in some instances with considerable skill. At Blenheim a strong battery placed on the right wing of the allied army enabled the French, greatly contributing to the victory; and at Malplaquet a battery of forty pieces was advanced in the centre by Marlborough. The Royal Artillery dates its history as a regiment from 26th May, 1716, when the whole artillery force of the British army was fused into two companies. This number was rapidly increased during the century, and efficiency was greatly promoted by the establishment (in 1741) of the Royal Military Academy at Woolwich for the instruction of cadets, and of officers and men of the artillery. Three companies of the Royal Artillery took part in the battle of Minden in 1759, and were handled with great success; and even in those days the English artillery won praise from foreign critics. In his "Battles and Principal Combats of the Seven Years' War," Decker says, "The English artillery was distinguished by its lightness, its elegance, and the good quality of its materials. In the battle of Marburg (1760), although the English artillery was not horsed, it followed Lord Granby's cavalry at a trot, and was always ready to engage." "The English artillery," says Tempelhof, "could not have been better served; it followed the enemy with such vivacity, and maintained its fire so well, that it was impossible for the latter to re-form." It must be admitted, however, that during the eighteenth century far more substantial progress in artillery improvement was made on the Continent than in England. In Prussia these improvements were carried out by Frederick the Great, in Austria by Prince Lichtenstein, and in France by Gribeauval. The Russians, who have always considered artillery as a principal arm, employed

large numbers of guns, and were foremost among Continental nations in mounting the gunners, and in otherwise securing rapidity of movement.

Previous to the experience of the Seven Years' War (1756-63) field artillery was far too heavy and immovable, the pieces being dragged by the gunners on the field, the horses being kept under cover near them. Artillery was at this time separated into—(1) regimental or battalion guns; (2) artillery of position; (3) garrison or siege artillery. The first were attached to infantry at the rate of two guns to a battalion. These were intrusted to a corporal, who acted under the immediate orders of the commander of the battalion; and, generally speaking, the latter was too much occupied with his men to think of the cannon. These were unlimbered at 500 paces from the enemy, and dragged 150 paces further by the men before firing. The battalion followed pretty closely behind the guns, which, in case of a check, were usually lost from want of time to limber up. The position artillery was mainly distributed into several large batteries, in favourable positions, on the wings or front of the line; and the guns being heavier and more cumbersome than those of the battalion, it was extremely difficult for them to follow any shifting of the order of battle. The siege guns were formed into a train, as at the present day.

Frederick the Great entered upon the long conflict of 1756-63 single-handed, and besides being confronted with the united power of Russia, Austria, and France, he was heavily weighed by his own comparative disregard, if not contempt, for artillery, which he looked upon as an obstacle to his brilliant plans of attack, deranging as it did the mathematical regularity of his evolutions. At the battle of Rossbach (1757), however, Fredeyck clearly saw that his guns were no match for the excellent and well-handled Austrian artillery, and that if victory was to remain on the Prussian side his preconceived notions must be abandoned. From this time he bent every effort to create an efficient and mobile artillery; and before the close of this prolonged conflict he possessed a horse artillery which in rapidity of movement could rival cavalry, and a field artillery the position of which could be changed according to the course of the action.

No country profited more, if so much, by the artillery lessons of the Seven Years' War as France. General Gribeauval, the leading spirit of the reform, had been attached to the command of Prince Lichtenstein, and was struck with the efficiency to which the Austrian artillery had been brought. Being ordered by the Duc de Choiseul to re-constitute the French artillery, he proceeded to build up a complete system, both of *personnel* and *matériel*, creating a distinct *matériel* for field, siege, garrison, and coast artillery. Alive to the vital importance of mobility for field artillery, he dismissed from its park all pieces of greater calibre than 12-pounders, suppressed ornaments from the guns, and bunched them with copper. To field carriages he gave greater mobility by the introduction of iron axle-trees and higher wheels for the limbers. Boxes on the carriage held part of the ammunition. Travelling trunnion poles were introduced. The horses were harnessed in pairs instead of in single file as formerly, and the *prolong* of rope was introduced, to unite the trail of the gun and the limber in slow retiring movements. A new ammunition waggon, carrying fixed ammunition, was also introduced. The service of the guns was improved by the introduction of cross-headed elevating screws and tangent scales; and the movement of the carriage by hand was facilitated by the adoption of the *bricole*, a collar with rope and hook, to which the gunners and foot soldiers harnessed themselves. The organization of the force was equally improved; the *battery* first appeared as the artillery unit, and the importance of

artillery as a special arm of the military service, with the necessity for a careful and distinct organization, was at length fully recognized. It was with the artillery force thus reorganized and improved beyond that of any other country whatever that the first Napoleon (himself an artillery officer) entered upon the great military schemes in which his sagacious use of artillery proved so powerful and conspicuous a feature.

At the same period the British artillery was in anything but an efficient condition, and far behind that of the power with which we were destined soon to engage in prolonged hostilities. The guns were dispersed among the infantry, they were horsed in single train, the ammunition was packed in rough deal boxes, the ammunition waggons were cumbrous and ill-constructed, the drivers were mere carters on foot with long whips, and the whole artillery equipment was at a decided disadvantage compared with that of Continental forces. This was the state of things in 1793; but by the exertions of an able officer, Major Spearmann, numerous reforms were introduced, with the result that, by the time of the Peninsular War, the Royal Artillery reached a fair degree of efficiency, distinguished itself on many occasions, and caused French officers and others to be loud in its praise. Amongst the leading reforms was the introduction of horse artillery, the idea being to compete with cavalry in rapidity of motion, every man being mounted. The guns and carriages, however, were still horsed by contract, as in the field artillery—a practice attended with much inconvenience, for if the “waggoners” became disabled the care of the horses devolved upon men entirely unaccustomed to them. To avoid this, horsing by contract was discontinued in 1794, and a driver corps established. In 1822 this was abolished, and men was enlisted as both gunners and drivers—an arrangement which lasted till 1858, when a proportion of men was allotted specially as drivers for each battery. In 1802 battalion or regimental guns were abolished, and field “batteries” of six guns became the rule. The horses were teamed in pairs, the drivers being mounted on the off horses, while eight gunners were carried on the limber and wagon. This gave great mobility to field artillery, and insured its being accompanied into action by a sufficient number of men to work the guns at once. The equipment was lightened and simplified, the ammunition was properly packed, and a correct system of manœuvres was introduced. The invention of Shrapnel shell by Major Shrapnel in 1803, and the transformation of the rocket from a mere signal to a destructive engine by Sir W. Congreve in 1806, also added to artillery power. Great augmentations of the force, moreover, took place during the wars with France, and in 1815 the Royal Artillery numbered 23,085 of all ranks, not counting that portion of the force maintained in India.

After the peace of 1815 great reductions took place in the artillery, as indeed in most other branches of the military service. The revolutions and wars which broke out in 1818 awoke the government to the conviction that efficiency was as desirable as economy; and it was fortunate for this country that by 1854—when the Crimean War commenced—our artillery establishments had been largely increased. In spite of this increase, however, the British siege train at Sebastopol never had sufficient relief during a bombardment, although a large naval brigade, to the detriment of the efficiency of the fleet, was employed in the trenches. The field artillery too was not sufficiently numerous, there not being two guns per 1000 men; and it was overmatched at Inkerman until the 18-pounder position guns and two French batteries were brought up.

The Crimean War was remarkable as being the first in which rifled guns were used. The advantages of rifling were advocated by Robins quite 100 years previously, but

the Russian war was the first which found the system in practice. Even then it was in a very limited degree. The troops, it is true, were all supplied with rifled muskets, but all the artillery was of the old smooth-bore pattern, except a few Lancaster guns, which were used with no great effect, owing to defective construction. The whole war, it may be said, was fought with artillery of the same construction as that of the days of Nelson, Wellington, and the first Napoleon. The only difference was that the calibre was somewhat increased, and the 68-pounder, procured from the fleet, was thought an enormous piece. The first rifled field artillery employed by our country in a campaign were the rifled Armstrong breech-loading guns used in China in 1860. A few years more found all the great powers supplied with rifled cannon, and guns were produced weighing 80 and 100 tons, and throwing shot of from 1600 to 2000 lbs. weight. See GUNS.

Field Artillery—that is, the artillery which is intended to accompany an army for operations in the field—may be divided into horse, field, position, and mountain artillery. There is but little difference between the first and second descriptions, and the experience of modern warfare favours the adoption of only two classes of artillery—horse or very mobile field artillery and position batteries of heavy guns, the latter for the defence of posts or entrenched camps, or for bombardments in cases other than those in which regular siege guns become necessary. In mountainous countries very light pieces, which can be transported on the backs of horses or mules, are substituted for ordinary field guns. The unit of field artillery organization is the *battery*, consisting in England, Prussia, and France of six guns; in Russia, Austria, Sweden, Belgium, and some minor states, there are eight; while in the Swiss artillery there are but four. Mixed batteries are sometimes formed, but usually they are of one class, the equipment and service being thus much simplified.

The ammunition for service in the field is carried in the gun limbers and in ammunition waggons, and the number of rounds per gun is based on what is deemed sufficient for a considerable action. At the battle of Lützen, which the French gained over the Prussians in 1813, about 220 rounds were fired from each gun, and upon this they afterwards based the amount of ammunition required for field guns. When the proportion of field artillery with an army is considerable, the quantity of ammunition to be transported is enormous, as it is always necessary to provide against the contingency of a great battle. Thus, although at the battle of Leipzig in 1813 the French artillery had 220,000 rounds, this immense supply was not found adequate.

The number of guns per 1000 men of an army varies, but the general result of a war has been to increase the proportion very considerably. Thus Frederick the Great entered upon the Seven Years' War with two and a half per 1000 men, but towards the end it was four, five, and even seven per 1000. Napoleon's grand army for the invasion of Russia averaged about three guns per 1100 men; in 1815 the French had but two per 1000; the British, in their contests with Napoleon, had two and then three per 1000. In the Crimea the artillery with the British force was not quite two per 1000; latterly (since 1871) the proportion has been increased to fully three per 1000. The power of efficient artillery was shown in such a remarkable degree in the Franco-German War of 1870-71 that France immediately afterwards increased its service by 120 batteries. Germany also added largely to its artillery force; at present the Germans have less than three guns per 1000, but considering the size of her army this amounts to an enormous number. Russia, within three years of 1871 had purchased or manufactured no less than 1000 rifled guns for field and fortress use, and her field artillery alone now comprises 2400 rifled guns; while Austria, which

always had a brilliant reputation for efficient artillery, entirely remodelled its service in this respect, and would at any time prove, as in 1866, a most formidable foe. The breech-loading system for field guns was abandoned in England in 1872, but most Continental powers continued to adhere to it, and now, owing to modern improvements in the *artillerist's* art, the British government has been compelled to return to it. As an example of modern field artillery we give on Plate II. elevation and plan of a British muzzle-loading field-gun and its limber. The gun carriage consists of three parts—the wheels, the axle, and the trail. The axle carries two seats for gunners; into the trail are fitted the elevating screw and wheel. The gun upon the carriage is shown in the firing position; when it is desired to move it the point of the trail is raised, and the trail-eye is passed over the limber hook and keyed fast. The gun-carriage and limber then form a four-wheeled vehicle. The limber consists of wheels and axle-tree similar to those of the gun-carriage, ammunition boxes, platform, and a pair of shafts. In the British service each gun-carriage and limber is drawn by three or four pairs of horses, according to the nature of the piece. The driver of each pair mounts the near horse; the off-wheel horse is between the shafts.

Siege and Garrison Artillery have not usually the complete and permanent organization that distinguishes field artillery. In India and some European countries permanent siege trains are maintained, but usually the *matériel* is kept in store, and the *personnel* and transport are supplied from other sources according to requirement. In garrison artillery the guns mounted on fortresses and batteries, or stored in arsenals for the purpose, furnish the *matériel*, and the battalions or companies of garrison artillery the *personnel*. The proportion of guns, &c., in a British siege train would be approximately—fifty-five 64-pounder guns, twenty 40-pounders, thirty 8-inch howitzers; total, 105; to which would be added rifled and smooth-bore mortars according to circumstances. Germany's most prominent military power of the Continent, uses for siege purposes the 12-centimetre (4·68-inch) gun, firing a 29-lb. shell, and the gun of 15-centimetre (6·85-inch) calibre, firing a 54-lb. shell. The mortars used are the 8-inch rifled and the smooth-bore 15-centimetre. There are two siege trains, each with between 400 and 500 guns, and each gun has 508 rounds of ammunition ready for immediate service. The siege trains in time of war have each sixteen ammunition columns, each consisting of forty-six ammunition waggons, six open waggons, a forge, and some baggage and forage carts.

The British *garrison battery* consists only of *personnel*, the *matériel* used being part of the defences or fortress in which this branch of the artillery is employed. The establishment of a garrison battery consists of four officers, sixteen non-commissioned officers, and about 120 gunners and trumpeters, augmented in war time to 142. The care and preservation of the ordnance in fortresses and batteries, with all the complicated appliances and scientific constructions of modern artillery *matériel*, and of the carriages, stores, and ammunition, devolve upon the garrison artillery in peace time.

For fortress defence, and for volunteer artillery drill, numbers of smooth-bore 24, 32, and 68 pounder shell guns are still mounted in various parts of the country. They are, however, being gradually superseded by rifled guns, with which indeed most of the important points of national defence have long been supplied. The fortifications of Plymouth, Portsmouth, Dover, Tilbury, &c., are armed with magnificent guns of 18, 25, 35, 81, and even 100 tons. Plate III., fig. 1, shows elevation of Armstrong 100-ton gun; fig. 2 is a section of same, showing the numbers by which the various coils of which it is built up are known. The inner lining of the gun is of steel, and the outer coils

of wrought iron shrink on. The part of the bore intended to receive the charge (called the powder chamber) is considerably enlarged in calibre. Fig. 3 is an elevation of a Woolwich 81-ton gun. Gibraltar, Malta, and many other points of our colonial empire, are also furnished with these formidable pieces of artillery, the destructive power of which was shown in a remarkable manner at the bombardment of Alexandria in 1882, when for the first time guns of 81 tons were used in actual hostilities.

"Coast batteries" are usually erected on important situations commanding the mouth of a river or harbour which it is requisite to defend; also to defend the different dock-yards, to oppose the landing of an enemy on any part of the coast, and to prevent the approach of his vessels, either for any aggressive purposes or for soundings and observations. A certain proportion of rockets would be used by these batteries in the protection of beaches, &c.

The guns of fortresses and coast batteries are generally mounted on wooden standing garrison carriages, though all descriptions of naval as well as siege carriages may be employed if desirable. Mortars are provided with beds. The ordinary platforms to be preferred are the ground platforms, constructed sometimes of wood, but usually of stone, and the dwarf traversing platforms, the latter being chiefly used for mounting guns in the salients of works; in casemated fortresses a low traversing platform may also be made use of. The usual practice with fortress and naval guns has been to fire them from embrasures, but the accuracy of modern artillery is such that these openings too often act as funnels to conduct an enemy's projectiles into the very heart of defences. To meet this difficulty Captain Moncrieff devised a carriage and system of mounting by which the gun is loaded and laid in a gun pit, raised by a counterweight, and released again, descending after firing by the regulated power of the recoil. By this means the gun is effectually protected from direct fire, and security is obtained for the gunners when loading.

The subject of gun platforms is more fully dealt with in our article on GRX, but with regard to the Moncrieff carriage, of which a Plate is annexed (see Plate IV.), we may observe that its principal parts are the carriage, the elevators, and the platform. The carriage, consisting of iron brackets with stool bed and elevating screw, is supported between the elevators on a strong bolt or shaft passing through them from side to side; each bracket has a truck in rear to run upon the inclined frame of the platform. The elevators are merely two very large iron brackets, with a box between them to hold the counterweight, which is rather heavier than the gun; they are carved in rear, and provided with teeth to run in rolling back upon the horizontal side pieces of the platform, which have corresponding teeth. The platform, consisting of iron side pieces and frame above, traverses round a central pivot by means of four trucks running on rollers. A self-acting break-wheel, with a pinion inside working into a cycloidal arc on the elevator, is attached to the platform, to hold the elevators down and to check them in rising when necessary. When the gun is fired, the recoil of the carriage forces the elevators to roll backwards upon the platform, the gun therefore descending and the counterweight rising. The weight of the latter gradually checks the motion, and brings the gun to rest when below the parapet; the break preventing the gun being again raised by the fall of the counterweight, the piece can be loaded under cover of the parapet, and by releasing the break it can be quickly raised for firing. It was observed in the course of the bombardment of Alexandria, already referred to, that some Egyptian guns mounted on this (*en barbette*) system were the most difficult of all to silence; and this first demonstration of its efficiency in actual warfare raised it highly in official favour. The experience of the British ironclad *Téméraire* during the same engagement brought

out still more fully the immense advantages attending this system; and for guns in use on land its utility in affording shelter for the gunners is obvious. The only drawback of the Monieriff system is that the counterweight more than doubles the weight of the gun; but this may be obviated by the adoption of hydraulic power acting upon a cantilever—the force of recoil being utilized to cause the descent of the piece.

General Organization.—The whole of the British artillery forms one regiment, "the Royal Regiment of Artillery," numbering 1414 officers and 33,688 men, and is distributed into 216 batteries of horse, field, and garrison artillery. For purposes of administration a unit higher than the battery is adopted, called the *brigade*. Each brigade has its own staff of colonel-commandant, four lieutenant-colonels, adjutant, quartermaster, &c. The batteries of the brigade are, as far as possible, kept in the same part of the country where the headquarters are serving. There are six brigades of horse artillery, twelve of field artillery, thirteen of garrison artillery, and the "coast brigade." Besides the brigade organization there is another which may be termed the territorial system, or district commands, having reference especially to local duties, stationary *matériel*, such as guns mounted on forts, batteries, &c. These artillery districts correspond generally with the army districts, and have at their head a colonel on the staff, or other officer commanding the artillery district.

The *Deputy Adjutant-general's Department* is charged (under the command-in-chief) with the discipline, promotion, and distribution of the Royal Artillery. The *Director of Artillery and Stores* regulates armaments and the introduction of new *matériel*, and superintends the manufacture of warlike stores. The *Manufacturing Establishments* are those of ordnance, carriages, and ammunition in Woolwich Arsenal, and the Gunpowder Factory at Waltham Abbey. The *Instructional Departments* are—(1) Royal Military Academy, Woolwich, for the preparation of cadets for the artillery and engineer services; (2) Department of Artillery Studies, Woolwich, for advanced scientific instruction, and for the instruction of officers generally in *matériel* and kindred subjects; (3) School of Gunnery, Shoeburyness, where are combined a school for practical artillery instruction of officers and men, and an experimental establishment; (4) Riding Establishment, Woolwich, for the instruction of officers, cadets, and men.

Artillery Tactics.—The advantages artillery possesses over other arms consist in the longer range and greater power of its projectiles. Its chief function, therefore, is distant combat, in which it can produce most destructive effects without the probability of being disabled by losses in men and horses. Although in some cases very formidable at short ranges, it is little suited to close combat, and less so in the present day than formerly on account of the extremely rapid and accurate fire of breech-loading small arms, and of machine guns, such as the Gatling, Gardner, and Nordenfolt guns, &c.

The main objects of artillery in the field are—

(1) To prepare the way for the action of other arms by creating disorder and confusion in the enemy's ranks, dismounting his guns, destroying slight obstacles, or rendering cover untenable.

(2) To support troops of other arms in their movements by preceding an attack, forming a rallying point in case of repulse, checking advancing columns of the enemy, harassing a threatening foe, covering a retreat, or defending the key of an important position.

(3) To decide an action, by the concentration of a number of *pieces* on an important point.

Artillery, to be effective, should combine accuracy and quickness of fire with considerable celerity of movement. The former of these will depend on the instruction and

general efficiency of the officers and men composing the battery, as well as on the nature of the guns employed; and the latter will be secured by having the carriages of suitable construction, well horsed and driven, for otherwise artillery becomes a troublesome and it may be even a useless appendage to an army.

In choosing a position on the field for artillery, the following principles should be borne in mind, viz. that the guns should command not only the approaches to the weakest point of the position, but also, if practicable, the whole of the ground within their range; that they should not inconvenience the manœuvres of the troops they support, and that they should be as far removed as circumstances will permit out of the range of any place which might afford a shelter for the enemy's infantry, and from whence the latter could harass the gunners. If this, however, be impracticable, one or more guns must be told off to keep down, with the assistance of the escort, the enemy's fire. When guns are employed to prepare for an attack, to defend a position, to protect troops in passing a river, &c., it is advisable that the batteries should be posted at some distance from each other, but able to concentrate and cross their fire on the ground in front.

The fire of guns should always be concentrated and converging when practicable, such fire taking an enemy's line obliquely, covering a large extent of ground by cross fire, leaving intervals for the movement of other troops, and entailing less liability to losses, because an enemy's fire is by this means dispersed. The introduction of rifled guns greatly increased the scope of concentrated fire, for the ranges being much longer than those of smooth-bore pieces, more ground can be covered, and the choice of ground is less restricted. The dispersion or concentration of guns for fire has been a much-debated point with artilleryists. If the object—that is, concentration of fire—can be attained by dispersion of batteries, it may be better, under certain circumstances of ground, to separate than to collect the artillery in large masses; on the other hand, dispersed batteries are much more out of control, and unable to receive the directing impulse of one mind, and usually the employment of large masses of artillery has a greater moral effect.

In the early days of artillery tactics guns had occasionally been massed, but usually with no clear aims as to their functions; nor was this state of things altered until the Napoleonic era. Bonaparte was himself originally an artillery officer; and it was his skilful handling of this important arm that contributed largely to the military success upon which his fame and his empire were founded. And the ultimate overthrow of that empire may be said to have been chiefly due to the masterly use of artillery by the Germans in the campaign of 1870-71, especially in the decisive battle of Sedan. The battles of the early part of the century present numerous instances of the remarkable power of well-handled artillery, and this, it should be remembered, before the era of the far-reaching and unerring rifled gun, and before any such marvellous celerity of movement had been attained as is now possible. So convinced was General Okounoff of the capacities of artillery that he prophesied it would become the principal arm in warfare—cavalry and infantry being mere subordinates. The reader who would understand the grounds of so bold a prediction may be referred to any good accounts of the battles of Friedland (1807), Wagram (1809), Lützen (1812), and Hanau (1813), in each of which engagements artillery played a very prominent and decisive part.

In the struggle for supremacy of the two great German powers in 1866, both combatants were armed with the then new rifled weapons, but their proper application would appear to have been entirely misapprehended. It was the first great war in which breech-loading rifles had taken

part, and the Prussians, with great confidence in the powers of their "needle gun," pushed forward great masses of infantry, whose rapidly-firing weapons told with terrible effect upon the less favourably armed Austrians. It was probably this confidence in the superiority of their small-arms that induced the Prussians to keep their artillery so far in the rear that its part was usually an unimportant one. At the important battles of Tratenau, Nachod, Skalitz, and Sadowa, comparatively few of the large number of Prussian batteries came into effective action; while the active manœuvres of their victorious opponents gave the Austrian artillery but little opportunity of displaying superiority of management or tactical training, though its heroism and self-sacrifice in covering the retreat on the eve of Sadowa is worthy of mention.

The campaign over, however, Prussia could not but know that the conditions of a future war would differ, inasmuch as every European power hastened to adopt breech-loading rifles—in some cases of a pattern superior to the needle-gun. Criticism, too, was loud in pointing out the gross military blunders which led to the neglect of artillery, and the result was a thorough revolution in the tactics of this important arm. This was abundantly seen in the war with France in 1870–71, when the capabilities and powerful effects of modern artillery were shown in a manner never before realized. On the memorable morning of 4th August, 1870, just as the too-confident Frenchmen were complacently preparing their early meal, there arose from every knoll and rising ground around Weissenburg the white puffs of smoke which showed the presence of Prussian guns. And from this first opening of hostilities to the end of the campaign the same tactical features were prominent on the victorious side. A battle was prelude by the bold advance of all available guns. The attack commenced with a concentrated fire of artillery, the moral if not actual effect of which enabled an offensive movement of infantry to be made with success, or at least kept the enemy in check till the flanking movements, so conspicuous in this war, were carried out. Two days after Weissenburg more than 100 guns were massed on the heights opposite Fröschwiller, and enabled a front attack to be made across the open valley of the Sauer. In the battles about Metz the massing of batteries was especially prominent; at Rezonville groups of six to ten batteries acted in effective concert; and at St. Privat enormous crushing masses of from 200 to 400 guns cannonaded the French position for some hours. At Sedan the German guns were pushed forward utterly regardless of escort, even in front of the advanced guards, and inclosed the ill-fated French army in an unendurable circle of fire. The numerous sieges during this war also bore witness in the most extraordinary way to the powers of far-reaching modern artillery. Fortress after fortress, which in former times could long have kept assailants at bay, fell after a few hours' or a few days' bombardment from rifled guns. The only chance of any prolonged resistance was where, as in the case of Paris, powerful outworks had been constructed so as to keep besiegers at a respectful distance from the town itself.

That short but brilliant campaign in Egypt in 1882 gave but little scope for the effective use of field artillery, and the circumstances, moreover, were scarcely favourable for fair comparison. If the forces of a thoroughly civilized nation, well versed in artillery science, had served the guns of the forts at Alexandria, or those behind the entrenchments of Tel-el-Kebir, victory would have been immeasurably more difficult and costly for Sir Garnet Wolseley and his gallant force. At Tel-el-Kebir, however, the way in which the English guns were manœuvred on the flanks and in pursuit of the enemy went far to prove the efficiency of the British artillery, both as regards men and material.

ARTILLERY COMPANY, HONOURABLE, the oldest existing volunteer corps in Britain, was first established in 1537, during the reign of Henry VIII. It received marks of favour from James I., who granted a patent to secure the shooting grounds round London for the Company, and in 1633 a commission was appointed by Charles I. for the same object. In 1638 the corporation of the city of London presented to the Company the plot of land known as the artillery ground, near Moorfields, for the purpose of military exercise. It has never been engaged in actual warfare, but in 1780 it successfully defended the Bank of England during the period of the "Lord George Gordon riots."

The members are elected by ballot, on a recommendation by five members, and pay an annual subscription of two guineas, besides supplying themselves with uniform. The cost of this, even for privates, is considerable—the uniform of the cavalry costing £29 9s., that of the artillery £18 14s. 6d., and that of the infantry £14 17s. 6d. The members engage "upon our honour to conform to all rules and orders, . . . and especially to appear under arms upon all occasions when the corps may be mustered for the purpose of assisting the civil power in maintaining tranquillity or suppressing riot." The Honourable Artillery Company (according to the Rules and Orders, 1880) consists of a squadron of light cavalry, an artillery division, and six companies of infantry, and has, in addition, a veteran company. It is governed, "except as to military affairs and military offences" (which are dealt with by a sort of court-martial duly provided for), by a "court of assistants," composed of delegates from each captain's company, and the principal officers, to whom are added (though without power to vote) the lord mayor, aldermen, and sheriffs of London. Originally it appointed its own officers, but the crown resumed this power by various royal warrants of the present reign, the last of which was in 1863. Yet even now the Company has considerable privileges in this matter, since no appointment can be made for more than five years, except that of the field officers; and these latter are the only officers really appointed by the crown—they, in the name of the queen, appointing all other officers (commissioned and non-commissioned) from the members of the Company. The captain-general and colonel of this Company is the Prince of Wales.

ARTIODACTYLA is a section of the *UNGULATA*, in which the toes are paired, being either two or four, and contrasts with the *Perissodactyla*, in which the toes are three or only one. The *Artiodactyla* comprise the *OMNIVORA* (hippopotamus and swine family), the *RUMINANTS*, and the intermediate extinct family of which the type is *ASOPIOTHERIUM*. The stomach is complex. If horns exist they are provided with bony cores. The number of vertebrae in the dorso-lumbar region is nineteen.

ARTISANS' DWELLINGS ACT, 1875, was passed to provide an efficient remedy for the ever-growing difficulty of supplying sufficient healthy dwellings for the labouring classes in our large towns. It provided that the local authorities in towns of 25,000 inhabitants may, on the report of the medical officers or sanitary board, acquire property and buildings of an unhealthy character by compulsory purchase for the purpose of improvement, and either build or let the land for building in accordance with a scheme prepared with special regard for the accommodation of the working classes, and sanctioned by the confirming authority, which for London is the home secretary, and for the rest of the country the local government board. Provision must in every such scheme be made for at least as many persons of the working classes as have been displaced by the improvement.

The local authorities in a few districts of London, and also in some provincial towns, have already availed them-

selves of the facilities furnished by the Act; but difficulties have arisen in London in consequence of the very high price which the Metropolitan Board of Works have been compelled to pay for condemned property.

ARTOCARPA CEE (the Bread-fruit tribe), a group of plants, forming a section of the order *URTICACEÆ* (the Nettle tribe). The juice is milky; the stipules large and convolute, the ovules solitary, the embryo straight, ex-albuminous, with a superior radicle. The species are all found in the warmer parts of the world, and many of them are natives of the tropics only. Their milk, which is always acrid, renders some of them intensely poisonous, as the Upas tree of Java and certain Indian species of fig; nevertheless, if the milk is naturally absent from any particular part of an artocarpaceous plant, that part becomes eatable and even wholesome. Thus the fruit of the cultivated fig, up to a short period before its maturity, remains milky, and at that time it would prove exceedingly unwholesome; but when ripe the milk disappears, is replaced by sugar, and the fruit becomes extremely wholesome. The same explanation is applicable to the case of the Bread-fruit, which forms an article of food with the South Sea Islanders.

ARTOCAR PUS. See BREAD-FRUIT.

ARTOIS, an old province of France, nearly corresponding with the modern department of Pas de Calais. The capital of the province was Arras. It belonged to the counts of Flanders from the ninth to nearly the close of the twelfth century, when it was bestowed on Philip Augustus of France as the dowry of Isabella of Hainault. It was made a county by Louis IX. in 1239, who bestowed it on his brother Robert. Later it passed again into the hands of the counts of Flanders and the dukes of Burgundy, but was finally ceded to France at the peace of Nîmègue in 1678. Charles X. in early life bore the title of Count of Artois. The province consists for the most part of a fertile plain, well watered and cultivated.

ARTS, DEGREES IN. Degrees, such as are now given in our universities, probably originated with the incorporation of *UNIVERSITIES* in the eleventh and twelfth centuries. The circle of the seven liberal arts in the eighth century was divided into the *trivium* (grammar, rhetoric, and logic) and the *quadrivium* (arithmetic, music, geometry, and astronomy). These varied somewhat afterwards; but medicine, theology, and law were always held distinct from the arts. The professors of arts came to be called Masters, those of the other faculties (and also of music), Doctors. The standing of such teachers was marked by their *gradus* or degree in the university. Such degrees were commonly, and are still occasionally conferred; but the irresistible tendency of modern universities is to make the degree the mark of a certain proficiency in its particular faculty, usually tested by an examination.

The term *master* is believed to be the oldest among those of graduation. Eugenius II., by the 34th canon of a council held at Rome in 826, mentions the appointment of *magistri* and *doctores* (masters and doctors). This was confirmed by a decree of Leo IV. in another synod at Rome.

Gregory IX., whose pontificate continued from 1227 to 1241, is said first to have instituted the inferior rank of *bachelors*, whose name was derived from *bacilla* (little staves), either because they were admitted by receiving a little wand, or because as following the title adopted for the novices of the soldiery, who exercised with sticks in order to learn to fight with arms. The bachelors were exercised in disputations, of which the masters were the moderators.

The degrees both of Bachelor and Master of Arts were conferred at Oxford in the time of Henry VIII., and the degree of Master of Arts probably much earlier. The degrees for laws are said to have come into use in 1149, medicine in 1354, and music in 1463.

ART-UNIONS are societies for the encouragement of the fine arts by the purchase of works of art out of a common fund raised in small shares or subscriptions; such works of art, or the right of selecting them, being distributed by lot among the subscribers or members. Their success in Germany led to the establishment in 1831 of the Art-union of Edinburgh, and in 1837 of the Art-union of London, which, though it has given rise to many others, remains at the head of such societies in this country. In it every member subscribes annually the sum of one or more guineas, receiving accordingly one or more shares in the advantages held out. Part of the sum thus raised is expended in the engraving of one or more works of art, of which every subscriber receives a copy; but though the prints thus distributed are such as would, in the ordinary course of trade, cost the full amount of the subscription, they are, owing to the combination of a very large body of subscribers, and the avoidance of risk, produced at so small a cost as to leave the greater part of the subscribed funds available for the purchase of original pictures or pieces of sculpture. The sum thus appropriated is divided into prizes of from £10 to £300 or £400, which are distributed by lot among the subscribers; the prize-holders being allowed, under certain restrictions, themselves to select works of art to the specified amount. These works of art, previous to their delivery to the prize-holders, are gratuitously exhibited for three or four weeks to the subscribers and the public. The amount subscribed to the Art-union in the first year of its establishment was only £489 6s.; but it is now annually over £13,000—nearly half of which is allotted for the purchase of works of art, the remainder being devoted to engravings and to various measures for promoting national taste in matters of art. The expenditure of British art-unions of all kinds on the encouragement of art is now calculated at more than £100,000 per annum.

Doubts having been raised as to the legality of art-unions, temporary acts were passed in 1841 and 1845 to indemnify their managers from the penalties to which they were supposed to be subject; and in 1846 an act (9 & 10 Vict. c. 48) was passed to legalize such as have been or may be incorporated by royal charter, or may have their rules or deed of partnership approved by a committee of the privy council. The Art-union of London was incorporated by royal charter on the 1st of December, 1846.

These laws still remain in force, but the usefulness of these societies having been called into question, a select committee was appointed to examine their mode of operation, which published its report in 1866. The decision arrived at by the committee was that "the tendency of art-unions has been to foster the love of chance and speculation rather than to encourage high art." The working of the London and the Scottish associations was found to be satisfactory, but it was found that in the shilling art-unions the amount spent in prizes was for the most part very small, the mode of drawing them open to grave question, and that the expenses amounted to about 50 per cent. of the receipts.

ARUM, a genus of *AROIDACEÆ*. The only British species is *Arum maculatum* (Lords and Ladies' Wake R bin); large quantities of starch exist in its tubers, but careful treatment is necessary in the extraction on account of the poisonous juices of the plants. Portland Arrow-root was at one time obtained from it.

It is also most interesting in connection with the fertilization of plants by insects. On the central pillar (spadix), just where the encircling "spathe" narrows, some hairs may be seen pointing downwards; below these is a circle of anthers, full of pollen, which is required to fertilize the seed; below these again is a circle of ovaries with the young seeds. At first sight it would appear that nothing could be easier than self-fertilization from the pollen dropping upon ovaries

at a lower level. But this is impossible. At the top of each ovary is a small surface, the "stigma," which becomes moist and sticky to catch the pollen when the ovary is ready to be fertilized, and then whether fertilization takes place or not it dries up. Now the anthers do not shed their pollen until the stigmas have dried up, and therefore if pollen is not brought by some means or other from another plant, no seeds are ripened. The way in which it is effected is this: insects creep down at the throat of the spathe for the sake of the honey at the bottom, and are prevented from returning by the hairs which point downwards. When the pollen has fallen, and dusted the insects all over, the hairs at the mouth of the trap wither, and allow them to escape. They then go to a neighbouring Arun for more honey, and with the pollen fertilize the ovaries in their passage down. Again they are entrapped, until they are covered with more pollen, and their journey and work begin anew.

ARUN (river). See SUSSEX.

ARUNDEL, a small town, and formerly a parliamentary borough in Sussex, on the river Arun, a short distance from the sea, 55 miles S.S.W. from London, with which it is connected by the Brighton and South Coast Railway, and 10 E. by N. from Chichester. It stands on a declivity on the N.W. bank of the river, the course of which is very winding in this neighbourhood. The trade of the place is small, though vessels of 200 tons can come up to the town, and a canal unites the Arun with the Wey, an affluent of the Thames. Arundel was constituted a member port of Chichester as far back as the time of Charles II. It subsequently became an independent port; but in 1864 the customs establishment was transferred to Littlehampton, 4 miles distant, on the east bank of the Arun, whence fast iron steamers now ply to Havre and Honfleur, thus bringing these ports within eight or nine hours of London. The church at Arundel is an ancient Gothic structure with a low tower. The chancel contains many monuments of the former owners of the castle and others. The high altar is considered one of the best in England. A magnificent Roman Catholic cathedral was built at the expense of the Duke of Norfolk in 1871-73.

The most striking feature in Arundel is the ancient castle, which gives to its possessor (now the Duke of Norfolk) the title of the Earl of Arundel. The castle stands high, on a steep circular knoll, partly natural, partly artificial, close to the town, and is inclosed on the N. and W. by a deep ditch, now dry. It commands an extensive prospect over the low flat country towards the sea as far as the Isle of Wight. The castle is mentioned as early as the time of King Alfred, who bequeathed it by his will to his nephew Adhelm. After the Norman conquest it was given by William I. to his kinsman Roger de Montgomery, created Earl of Arundel and Shrewsbury. Afterwards it passed into the family of Albini, from them to the Fitz-Alans, and at last, by marriage of the heiress of this race with Thomas, duke of Norfolk (in the reign of Elizabeth), into the family of the Howards, by whom it is still retained.

In the civil war between Charles I. and his Parliament, Arundel Castle was held and garrisoned by the latter. It was, however, taken by Lord Hopton in 1643, surrendering to him at the first summons; and two months after was as suddenly retaken by Sir William Waller. From that time it continued little better than a mass of ruins until the present century, when it was restored to its ancient magnificence, and is now one of the most splendid mansions in England. The modern parts are in the Gothic style, built of freestone. The park is very extensive and finely wooded, including a great variety of picturesque scenery.

The town was incorporated by Queen Elizabeth, and the corporation consists of a mayor, four aldermen, and thirteen councillors. It formerly returned two members to Parlia-

ment, but the Reform Bill of 1832 reduced the number to one, and in 1868 it formed one of the seven smallest English boroughs which were totally disfranchised. The town-hall, a fine castellated building, was erected at an expense of £9000, and presented to the corporation by the Duke of Norfolk. The population in 1881 was 2718.

ARUNDEL MARBLES, certain pieces of sculpture, consisting of ancient statues, busts, mutilated figures, altars, inscriptions, &c., the remains of a more extensive collection formed in the early part of the seventeenth century by Thomas Howard, earl of Arundel, and presented in 1667 to the University of Oxford by his grandson.

In 1603, soon after James' accession, Arundel was restored in blood by Act of Parliament, and to such honours as he had lost by his father's attainder, as well as to the earldom of Surrey. The dukedom of Norfolk itself was detained from him. In 1607 the Earl of Arundel was sworn of the privy council. He soon after travelled into France and Italy, and during his stay in those countries he imbibed that love for the fine arts by which he was afterwards distinguished, and began to form his collection.

In 1614 he abandoned Roman Catholicism for the Church of England, and henceforth stood high in favour at court, being restored in 1621 to the dignity of Earl Marshal, hereditary in his family. In June, 1641, he presented a petition beseeching the king to restore him to the dukedom, but Charles would favour him no further than by the grant of a patent creating him Earl of Norfolk. Disgusted by this half-measure, and foreseeing the dreadful storm which was then gathering, he quitted his country. He wandered slowly over most parts of Italy, and at last settled at Padua, where he died at sixty, in 1646.

The Earl of Arundel's character has been drawn at considerable length by the Earl of Clarendon. He was the patron of many distinguished men, amongst whom were Vandyck and Inigo Jones. It was from his example and recommendation that Charles I. was induced to study and encourage the arts. When Lord Arundel determined to collect a gallery of statuary, he retained two men of letters for that purpose. The well-known John Evelyn was sent to Rome, and Mr. (afterwards Sir William) Petty undertook a hazardous journey to the Greek islands and the Morea. We learn from catalogues that the Arundel collection, when entire, contained 37 statues, 128 busts, and 250 inscribed marbles, exclusive of sarcophagi, altars, and fragments, and the inestimable gems. That part of the original collection not presented to Oxford was sold in 1678. The Pembroke collection, the Pomfret marbles, and the Marlborough gems are portions of this. Of these the Pomfret marbles were given to Oxford in 1755.

The Arundel and Pomfret marbles are at present preserved at Oxford in two rooms belonging to the public schools beneath the picture gallery. Of the Arundel portion, that which the university places at the head of its collection is the Greek inscription known by the name of the *PARIAN CHRONICLE*, having been made in the land of Paros about 250 years before our era, and giving the dates or Grecian history for the preceding thirteen centuries. It is much mutilated, but even in its present state is of great value to the antiquary.

(Selden's "*Marmora Arundelliana*," and the "*Marmora Oxoniensia*" of Prideaux, Maittaire, and Dr. Chandler; Dallaway's "*Anecdotes of the Arts in England*.")

ARUNDO is a genus of GRASSES. The *Arundo Donax*, a native of the south of Europe, the Caucasus, Egypt, and Siberia, is one of the largest grasses that we have in cultivation; it is not unusual to see it, in rich soil, 9 or 10 feet high, with leaves as broad and as long as the blade of a small sword. A beautifully variegated variety is that which is usually seen in gardens. *Arundo phragmites* is the common REED.

ARUSPEX. See HARUSPEX.

ARVE, a river which rises in the mountains of Savoy, flows to the N.W., and falls into the Rhone just below Geneva, after a course of about 50 miles. Its waters are chiefly derived from the glaciers which cover the northern face of the chain of Mont Blanc, in consequence of which the stream is very rapid, and often inundates the surrounding country.

AR'YAN, the name used to designate an ethnological division of mankind, and the group of languages spoken by the different peoples of which it is composed. It is derived from the Sanskrit *arya*, which, in the later forms of that language, signified "noble," or "of a good family," but which is also believed to be derived from the root $\sqrt{\text{AR}}$, to plough, and to have originally meant "husbandman." It was used for a long period as a national name, and in the "Laws" of Manu India is called Arya-avarta ("the abode of the Aryas"). It was also used by the Medes and Persians, and one of the titles of Darius was that of Arya of the Aryans. It is synonymous with the terms Indo-European, Indo-Germanic, and Sanskritic, as well as with the less generally known "Japhetic" and "Mediterranean," which have been proposed and used by some scholars. Vestiges of the old name are still found in *Iran* (Persia), *Armenia*, *Iranat*, &c.

Our knowledge of this subject dates from the commencement of the study of comparative philology, and the labours therein of Grimm, Schlegel, Humboldt, Bopp, and Max Müller—labours that have resulted in the "discovery of a new world," and have already revolutionized the views formerly held concerning the ancient history of mankind. By a skilful and patient comparison of the languages, ancient and modern, of Europe and Asia, assisted by a knowledge of the mode in which every language spoken and written grows and becomes altered, the cloud that veils the early history of this portion of the human race has been rolled back, and we obtain glimpses of the life that was lived by its ancestors many thousands of years ago. The methods by which this knowledge has been gained cannot be detailed here; but it is now known with certainty that there is a family relationship between the various nations of Europe (with the exception of such isolated peoples as the Turks, Magyars, Basques, and Finns) and the Armenians, Persians, Afghans, and many of the peoples of India. The evidence of this rests upon the fact that between the Sanskrit, Zend, Keltic, Teutonic, Slavonic, Greek, and Latin languages there exists so close a resemblance that it can only be accounted for by supposing them to be the off-spring of one mother-tongue. "They all count with the same numerals, call their individual speakers by the same pronouns, address parents and relatives by the same titles, decline their nouns upon the same system, compare their adjectives alike, conjugate their verbs alike, and form their derivatives by the same suffixes."

The European division comprises these great branches—Teutonic languages (to which English belongs); Keltic (as Welsh); Latin; Romance (as French, Italian, &c.); Greek (ancient and modern); Slavonic (as Russian); and Lithuanian.

The A-Static division comprises Sanskrit (dead, like Greek and Latin) and its living descendants Hindi, Hindustani, &c.; Gipsy; Iranian (as Zend and Persian); Armenian; Kurdish; and Afghan; as well as Pali (the sacred language of the Buddhists), and the dialects of Ceylon.

Of this original mother-tongue the languages mentioned, with those of later date to which they in turn have given rise, are all that remain, the Aryan language itself having passed away. The language that on the whole has preserved its words in the most primitive state is Sanskrit, but it is certain that this was not the parent of the others, for each of them has retained some forms which Sanskrit has lost. There is

no history, nor has any tradition been discovered, of the nation that spoke the original (Aryan) language, but nearly all ethnologists are agreed that the original home of the people who used it was the plateau of Central Asia—the country east of the Caspian and north of the Hindu-Kush and Paropamisian Mountains. From this region successive migrations took place towards the west, following two lines of route—one through Persia and Asia Minor, crossing into Europe by the Hellespont, or through the country between the Caspian and the Black Sea; and the other passing round by the north of the Caspian Sea. It is thought that the earliest of their movements brought the Keltic tribes, who have left traces of their path in the names of places and rivers throughout a large part of Europe. Later on came the ancestors of the Greeks and Latins, and by the northern route the ancestors of the Slavonic and Teutonic peoples, by whom the Kelts were pushed further and further towards the west. At a still later period other streams poured over the Hindu-Kush and the Himalaya Mountains, taking possession of Persia and India. A beautiful imaginative description of the manner of these migrations is given by Kingsley in his "Alton Locke."

Concerning the state of civilization reached by the original stock, very much has been learned by the comparison of the different languages, and the knowledge thus gained has been admirably expressed by Professor Max Müller in his "Oxford Essays" (1856). That the nation or people had advanced far beyond the savage state is most certain. We know that they possessed (because they had names for these things) houses and towns, cultivated the ground, reared cattle, and kept domestic animals, made cloth and pottery, and were acquainted with the use of the more easily worked metals. The bear and the wolf were foes that ravaged their flocks; the mouse and the fly were already their domestic pests. They had distinct names for father, mother, son, and daughter, and also for the more distant relationships of father-in-law, mother-in-law, &c. They had also given names to numbers, using the decimal system, up to one hundred at least; but there is no general Indo-European name for "thousand." Some of the stars were noticed and named; the moon was the chief measurer of time. They were not acquainted with the sea—that is, no common name for sea exists with their descendants—but they had small boats moved by paddles or oars for the lakes and rivers, the use of the mast and sail not being apparently known until after the dispersion. Their weapons were the sword, spear, bow, and shield.

They appear also to have had a form of government; and the groups of families making up the clans or tribes were presided over by chiefs, who held the office of judge as well. Concerning their religion, it appears to have been a worship of the powers of nature; and they used prayer and sacrifice, erected altars, and had conceived the idea of a spiritual as well as a bodily life. They do not seem to have had a priesthood. It has been pointed out by Professor Max Müller that the name given to the chief deity in the Rig-Veda, and those used by the Greeks and Latins, viz. *Dyaus-pitar*, *Zeus-pater*, and *Jupiter*, have all the same meaning, and are derived from a primitive form meaning Heaven-Father, a "name given to the unknown God before Sanskrit was Sanskrit or Greek was Greek."

With the beautiful comment of the Professor upon this fact we bring this article to a close:—"Thousands of years have passed since the Aryan nations separated to travel to the north and the south, the west and the east; they have each formed their languages, they have founded empires and philosophies, they have each built temples and razed them to the ground; they have all grown older, and it may be wiser and better; but when they search for a name for what is most exalted and yet most dear to every one of us, when they wish to express both awe and love, the infinite and

the finite, they can but do what their old fathers did when gazing up to the eternal sky, and feeling the presence of a Being as far as far and as near as near can be; they can but combine the self-same words, and utter once more the primeval Aryan prayer, Heaven-Father, in that form which will endure for ever, 'Our Father which art in heaven.'

ARYA ROOTS. As a specimen of the manner in which the primitive word has become altered through the long ages, we take at random a few roots—some numerals, a verb, and a noun. ✓ **DWA** becomes in Sanskrit *dva*, in Persian (Zend) *dea* also, in Greek *δύο*, in Latin *duo* also, in Albanian *dü*, in Gaelic *da*, in Gothic *twai*, in German *zwei* or *zwo* (now becoming old-fashioned), in English *two*. The French *deux* (whence our *deuce*) comes from the Latin *duo*, that is, from its accusative plural, a very general mode of derivation in the Romance languages.

✓ **TRI.** Sanskrit, *tri*; Persian, *thri*; Greek, *τρεῖς*, *τρία*; Latin, *tres*, *tria*; Albanian, *tre*; Gaelic, *tri*; Gothic, *threis*, *thrija*; German, *drei*; English, *THREE*. (French, *trois*, from Latin *tres*.)

✓ **BIH.** Sanskrit, *bhu*; Persian, *bu*; Greek, *φύω*; Latin *fui* (I was); Welsh, *bu* (was); Russian, *буи*; Anglo-Saxon, *beom*; German, *bis* (I am); English, *BE*. (French *fus*, was, from Latin *fui*.)

✓ **PA,** the supposed Aryan root, with a signification of feeding, nourishing; hence some unknown Aryan word for father. Sanskrit, *pitrī*; Persian, *pidar*; Greek, *πατήρ*; Latin, *pater*; German, *vater*; Danish, &c., *fader*; Icelandic, *faðir* (the *d* really *th*, with a special letter of its own); English, *FATHER*.

As a proof of the manner in which the theory as to the habits of life of the Aryans was arrived at, we take one or two of the words in the paragraph above on that subject.

✓ **MUS** (to steal). Sanskrit *mushka* (a mouse); Persian, *mush*; Greek, *μῦς*; Latin, *mus*; Russian, *мышь*; German, *maus*; Anglo-Saxon, *mūs*; English, *MOUSE*.

✓ **SWAL.** Sanskrit, *svri* (to kill); German, *schwert*, sword; Icelandic, *sverd*; Anglo-Saxon, *sweord*; English, *WORD*.

It is needless to extend the list further. The reader is referred for the latest details on the whole of this most interesting subject to the works of Max Müller ("Oxford Essays," 1856; "Lectures on Language," 1864, &c.); Whitney ("Growth of Language," Lond. 1882); and to Professor Skeats' unrivalled "Etymological Dictionary" (Oxford, 1882), the standard work on English etymology. See also the articles GRIMM'S LAW, LANGUAGE, &c.

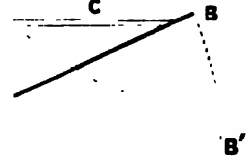
ARYTENOID CARTILAGES, the principal agent in the production of the voice. A blast of air between two parallel stretched elastic membranes almost touching by their edges, such that they can vibrate under its current, will produce a musical tone. Thus babies "trill" the lips; and thus also all trumpets, horns, and other brass instruments are played. The long tube of these instruments selects from the irregular vibrations of the trilling lips those which are harmonics of its prime tone, and a musical sound is produced. On this principle is the human larynx (throat) constructed. The elastic vocal chords are the membranous bodies lying horizontally, or nearly so, across the top of the windpipe; the lungs supply the current of air, the mouth and throat form a controlling cavity or tube. If, therefore, an apparatus can be devised which can instantly stretch the membranes to any required tension, which can vary the pressure of wind to the greatest nicety, and which can alter with ease to almost any shape and capacity the form of the controlling cavity, a musical instrument more complete than any other in the world will have been produced.

To sing perfectly we must be able to express each minutest shade of vowel-tone, of pitch, of force, of quality—desiderata whereof some are to be found in one musical

instrument and some in another. The marvellous instrument which combines the whole is the *human voice*.

It has been mentioned that membranes, in order to produce musical tones when blown through, must be tense, and with their edges close together. The tension of the membranous vocal chords is produced by the drawing down of the *thyroid cartilage* (the so-called "Adam's apple" in the throat), the operation of which may be roughly illustrated by the following diagram, where A stands for the

Fig. 1.



arytenoid cartilage, **T** is for the thyroid, and **C** for the vocal chords. It is evident that if **B** be pulled down to the position **B'**, the chord **C** will be greatly stretched. The thyroid cartilage is not in nature connected with the arytenoid, but both cartilages are connected with the vocal chords, the thyroid in front and the arytenoid behind.

The thyroid is like a **V**, or a chicken's "merry-thought" in plan, both the vocal chords being fixed in the angle of it (the "Adam's apple") at nearly the same point. The two arytenoid cartilages are symmetrical horned bodies placed one on each side towards the back of the throat, between the diverging sides of the thyroid. They are very freely articulated with their support (which may be roughly described as the top ring of the windpipe), so that by suitable muscles they may be easily drawn nearer together or wider apart; and each of them carries attached to it the hinder end of one of the nearly horizontal vocal chords. It is evident, therefore, that the vocal chords (that is, the inner edges of them) may be compared to a pair of compasses, the forward ends always close, the hinder ends capable of various degrees of divergence. When we breathe quietly, the two arytenoid cartilages, and with them the hinder ends of the vocal chords, are somewhat separated, so that the breath may pass freely and quietly, and the vocal chords lie in a narrow **V** shape, the point forward. If a deep breath is to be drawn, the opening between the arytenoids is made greater by the pull of the muscles acting on the outside (the crico-arytenoids), and the vocal chords now lie in a wide **V**. But if a musical tone is to be produced, the chords are stretched in the manner shown in fig. 1, by the depression of the thyroid cartilage; and

Fig. 2.



Ordinary position. Deep Breathing. Vocal.
Diagram of the Vocal Chords.

then, being now tense, their hinder ends are made to approach till they form a narrow slit, almost closing the opening of the throat by means of the arytenoid muscle, which draws together the horns of the arytenoid cartilages.

The above diagram (fig. 2) will perhaps make the action clearer; **T** is the point of anterior junction of the vocal chords in the **V**-like front angle of the thyroid cartilage, **A** are the points of their posterior junction with the right and left arytenoid cartilages. In whispering, the breath does not

pass between the vocal chords at all, but through a small triangular orifice behind them—that is, between the arytenoid cartilages—the vocal chords being kept quite close.

Seeing that accomplished singers can make ten or fifteen separate variations of pitch in a semitone, the extraordinary delicacy of adjustment of which the arytenoid and thyroid cartilages are susceptible must always cause astonishment and admiration. Professor Huxley ("Physiology," p. 199) considers it "perhaps the most singular motor apparatus in the body."

It is perhaps well to mention that the so-called "vocal chords" are not, properly speaking, *chords* at all, but elastic cushions, whose broad bases are fixed to the sides of the throat (larynx), and whose sharp free edges are the parts producing the effects which have been treated of above. See VOICE, LARYNX, THYROID.

AS, the Roman unit of weight and value. The word means *one*. It is indeed the *Faentine* (Italian-Greek) pronunciation of the Greek *ās*, one, and gives us the French *as* and our own *ace*.

As a weight it meant pound, and was more often called *libra* (the *£* of our *£ s. d.*), and our "pound," being divided into 12 *uncie*, a division still preserved in our Troy weight.

As a coin the *as* no doubt originally weighed a pound; and just as the "pound sterling" is now made of a much more convenient size and weight than the original pound of copper, and at the same time is materially altered in value, so it fared also with the Roman *as* or pound-coin. The coins of Servius Tullius, the first Roman who held a mint, were stamped with some animal, bull, ram, &c. (*pecus*, Latin), whence the Roman name for money, *pecunia*. A later coinage shows upon the *as* the figure of the two-faced god Janus on one side and the prow of a ship on the other—a coin figured in the size of the original in COINS, Plate III. Hence the ancient Roman form for "pitch and toss," Garbling youths in bygone centuries said not "head or tail," but "*capitum aut navim*" (heads or ships).

The *as* was at first cast probably in imitation of Etruscan coins. In the British Museum there are even four united together, as they were taken from the mould or matrix, in which many were cast at once. In most of the copies of the early *as* as preserved in our cabinets, the edge shows evidently where they were severed from each other, and where the piece at the mouth of the mould was cut off. From being cast it will be judged that they are not very correctly sized. As the *as* fell in weight it was not cast, but struck.

According to Pliny the *as* continued of its original weight till the first Punic War, when the treasury being exhausted, it was all at once reduced to two ounces. This, however, is improbable, and is confuted by the coins themselves, since we find them of all weights, from the pound downward to Pliny's two ounces. One or two of the pieces which remain might even imply that the decrease was quite slow, to eleven, to ten, to nine, &c.; but it is to be observed that neither the *as* nor its parts were ever correctly adjusted as to size, so that only the marks upon them, not their comparative magnitude, distinguish the divisions. The middle of the first Punic War being about B.C. 250, would be the time of the reduction of the *as* to two ounces, supposing Pliny to be correct.

He adds that in the second Punic War, when Q. Fabius was dictator, and the Romans were pressed by Hannibal, the *as* was further reduced to one ounce. This event is ascribed to B.C. 215. By the Papirian law the *as* was finally reduced to half an ounce. This weight continued till Pliny's time and long after.

The *as* had several coined divisions. The *semis*, half the *as*, or six *uncie*, was of various types, but always marked with an S. The *quincunx*, the division of five

ounces or portions of the *as*, is of very rare occurrence. All the other portions exist in the collection of the British Museum; but the *quincunx*, it is believed, exists in no cabinet at present in this country. The *triens* was the third of the *as*, or piece of four *uncie*. The *quadrans* was the fourth of the *as*, or piece of three *uncie*. The *sextans* was the sixth of the *as*, or piece of two ounces. The *uncia* was the twelfth of the *as*, or piece of one ounce. These divisions were marked on both sides with four, three, two, and one globules respectively to indicate their value.

As the *as* fell in weight, larger denominations of coins were struck, bearing names relative to it. The *as* was latterly marked I. The *dupondius*, or double *as*, was marked II.; the *tressis*, III.; the *quadrussis*, IV. There were even *decussas*, or pieces of ten, in copper, marked X.

The word *as* being "unit," was used not only for weight and value, but for all possible measures—*as*, for instance, of length, surface and capacity, interest, leases and agreements, &c. Thus *asses usuræ* meant 12 per cent.; *quincunx*, 5 per cent., &c.

ASAFÆTIDA is a gum-resin, obtained from the roots of the *Northez asafetida*, a perennial umbelliferous plant growing in Persia, Bokhara, and Beloochistan. In its recent and purest state it is white and transparent, but by exposure to the air it becomes of a clear brown colour, sometimes verging to red or violet, and of a waxy appearance. The inferior sort is dark-brown, of a dull fatty appearance, viscid, and greasy; it is called *asafetida* in masses. The smell of *asafetida* is penetrating, very disagreeable, and lasts some time. The taste is bitter, unpleasantly aromatic, of an alliaceous or garlic-like character.

As *asafetida* acts on the human system as a stimulant, more especially of the nerves of the chest and abdomen, it also influences, like all gum-resins, the vessels distributed on the lower portion of the abdomen or the pelvis.

It is very valuable as an antispasmodic, and in case of weak digestion, hysteria, colic, asthma, and whooping-cough. It is employed externally as a counter-irritant. In cases of organic disease of the heart, especially enlargement, and in fulness or congestion of the brain or spinal chord, or in any disease of these, *asafetida* is improper.

ASAM. See ASSAM.

AS'APHE, ST., a city in Wales, which, like that of Llandaff, is in fact only a village, the population in 1861 having been only 1900. It is situated near the western extremity of Flintshire, on the slope of a hill between the rivers Elwy on the W. and Clwyd on the E. The cathedral, erected in 1480, crowns the summit of the hill. It consists of a nave with aisles, choir without aisles, transepts, and central tower, and is one of the smallest of the cathedrals of England and Wales. The entire length from W. to E. is 178 feet. The architecture is generally of the style called Decorated English. The cathedral was thoroughly restored in 1870-75, at an expense of £10,000. The bishop's palace and the deanery were rebuilt about 1833. The cathedral is poor in monumental antiquities.

The diocese of St. Asaph comprehends nearly the whole of North Wales, including Denbighshire, the greater portion of Montgomeryshire, and parts of Caernarvonshire, Merionethshire, Flintshire, and Shropshire. The number of benefices in the diocese is 149, of which 121 are in the patronage of the bishop. The annual income of the Bishop of St. Asaph is £4200.

St. Asaph is a parliamentary borough contributory to the Flint district.

AS'ARUM, a genus of plants belonging to the family of the *ARISTOLOCHIACEÆ*. The *Aasarum europæum* is known by having two obtuse kidney-shaped leaves on each stem. It is a perennial plant, found in woods in different parts of

Britain. The root, which is employed under the name of *Asarabacca*, contains a camphor-like principle, and a bitter principle, called asarin, which is combined with gallic acid. To these it is indebted for its action on the human system. Taken into the stomach in a state of very fine powder, it causes vomiting; in coarser powder it generally purges. It was formerly employed as an emetic instead of ipecacuanha, but from the violence of its effects it is now properly laid aside in medical practice; it is still, however, used in veterinary medicine to produce vomiting and purging. The fine powder applied to the nostrils causes sneezing, and a flow of mucus from the membrane which lines the nostrils. A nearly allied species is the *Asarum canadense*, a native of Canada, which is a stimulant and diaphoretic. It is also called Wild-ginger, and is used as a spice, being of a warm aromatic nature.

ASBESTOS or **ASBESTUS** is a variety of the amphibolic minerals actinolite, tremolite, &c., which occur in long capillary crystals, placed side by side in parallel position, and thus give rise to a fibrous mass. These varieties the fibres of which are very delicate and regularly arranged are called *amianthus*, a Greek term signifying unpolluted, unstained. Of the finest kinds, the individual crystals are readily separated from each other, are very flexible and elastic, and have a white or greenish colour, with a fine silky lustre. Though a single fibre is readily fused into a white enamel, in mass it is capable of resisting the ordinary flame, so that when woven it produces a fire-proof cloth. Those varieties in which the crystals are coarser, with scarcely any flexibility, are called common asbestos. It is generally of a dull green, and sometimes a pearly lustre, and readily fuses below the blowpipe flame. It occurs more frequently than the amianthus, or finer kind, and is usually found in veins traversing serpentine. There are three other varieties—known by the name of mountain feather, mountain wood, and mountain cork—which differ from the common asbestos by the fibres interlacing each other.

The word *asbestos* is Greek for unconsumable. The ancients used it as a cloth to shroud their dead before placing them upon the funeral pile. They were thus enabled to collect the ashes for preservation in urns. They also used it in their temples as a wick to maintain perpetual fire.

AS'CALON, a town of Palestine, on the shore of the Mediterranean, about 12 miles N. of Gaza, was one of the "fenced cities" of the Philistines, but shortly after the death of Joshua it fell into the hands of the tribe of Judah; it was afterwards successively under the Assyrians, Persians, Greeks, and Romans.

There was a celebrated temple of the Heavenly Venus at Ascalon, which Herodotus (i. 105) mentions as having been plundered by the Seythians, 630 B.C. Forty granite columns, belonging to an ancient Greek temple, are still standing, with marble capitals and friezes. There are also the remains of a Roman amphitheatre. In the early ages of Christianity Ascalon became an episcopal see, and it was one of the strongholds of the Crusaders. On the plains of Ascalon a celebrated battle was fought between the Crusaders under Godfrey de Bouillon and the Saracens under the Vizier of Egypt.

The fortifications were destroyed by Saladin in the twelfth century, and the site of the ancient city is now little more than a desolate heap of ruins. Herod the Great was a native of Ascalon. At a short distance to the northward, 34 miles W.S.W. of Jerusalem, is the port for the small vessels that trade along its coast.

ASCA'NIUS, son of Æneas and Creusa. According to Virgil (*Æneid*) he accompanied his father to Italy upon the fall of Troy. After the death of Æneas, Ascanius left the town which he had built, and called, after his Italian

wife, Lavinium; and, guided by portents, founded Alba Longa, on a ridge of the hills, 15 miles to the south-east of Rome. In time the "Long White City," straggling along its narrow ledge of land, bounded and protected by the precipices which still mark its position at Albano, became the capital of Latium, and the national worship was held in that temple of Jupiter at the summit of the Alban Mount whose site may yet be traced, and whose fine pillars the mediæval monks barbarously built into the walls of their convent. Ascanius was followed by Silvius, son of Evrus and Lavinia, and the twelfth succeeding Silvius was father of Romulus and Remus, founders of Rome.

Ascanius was called Iulus as a boy, from the down (*Gr. ionlos*) on his cheek; and the great Julian gens at Rome, to which belonged the famous dictator (Caius Julius Cæsar), pretended to derive itself directly from him.

ASCA'RIDES. See *ENTOMOZOA*.

AS'CARIS is a genus of parasitic worms belonging to the order NEMATODA, the class NEMATHELMINTHA. These little parasites have a long thread-like cylindrical body. No special organs of respiration or circulation are found. The sexes are distinct; the males are smaller than the females, and much rarer.

One species of these animals, *Ascaris lumbricoides*, or common roundworm, is a parasite on man, taking up its quarters in the intestines. The young are probably transferred to the human "host" from minute insects accidentally swallowed, or from impure water. The worm is attached to the intestines by means of its mouth, which spreads out into a broad circular sucker within which a small tube may be protruded.

The *Ascaris nigrovenosa* inhabits the lungs of the frog. It is remarkable that one generation is parasitic and the succeeding one free. On this point Bastian gives the result of Mechnikow's observations thus:—"The young of this animal become real free nematodes; for after passing from the intestine of the frog into damp earth or mud, they grow rapidly, and actually develop, in the course of a few days, whilst still in this external medium, into sexually mature animals. Young, differing somewhat in external characters from their parents, are soon produced by them, and these attain merely a certain stage of development whilst in the moist earth, arriving at sexual maturity only after they have become parasites, and are ensconced in the lung of the frog."

ASCEN'SION DAY, a festival of the Christian church, on which the ascension of our Lord is believed by some authors to have been celebrated from the very first century of the Christian era. It has been held for ages on the Thursday next but one preceding Whit-sunday. (Brady's "Clavis Calendaria," vol. i. p. 357.) It is also called *Holy Thursday*.

It was on this day that in ancient times the minister of every parish, accompanied by his churchwardens and parishioners, was accustomed to go round the limits of his district, to deprecate the vengeance of God, to beg a blessing on the fruits of the field, and to preserve the rights and boundaries of the parish. The week in which Ascension Day occurs is usually called Rogation Week, from the Rogations or Litanies used in the perambulations. •

ASCEN'SION ISLAND lies in the South Atlantic, between Africa and Brazil. It is 685 miles N.W. of St. Helena, and 1450 from the coast of Africa. It is $7\frac{1}{2}$ miles long, and 6 wide. The island is of volcanic origin, and presents a surface of conical hills from 200 to 300 feet in height, some of them with craters. At the eastern part of the island is a double-peaked mountain 2818 feet high, which from its comparatively verdant appearance has obtained the name of Green Mountain. The whole island is of a desolate character, with a vast quantity of rocks lying upon each other, with great chasms between them,

and strewed with scorice, pumice, and other volcanic substances.

The island was discovered in 1501, and derives its name from having been seen on Ascension Day. It was then entirely barren and uninhabited. It was long supposed to be without fresh water, but springs were afterwards discovered.

In 1815, during the confinement of Napoleon at St. Helena, the British government took possession of Ascension Island as a military station. In 1821 the establishment was increased, and in consequence of the exertions of the garrison, great improvements were made in the resources, natural and artificial, of the island. Roads were constructed, and pipes laid down to convey the water from the springs to the fort, near which a large tank was excavated, capable of containing 1700 tons. The island contains some guinea-fowl, partridges, pigeons, and rabbits imported from the Cape of Good Hope, and also a few sheep and cattle. The coasts abound with a variety of fish of excellent quality; and quantities of turtle and turtle eggs are taken on the shores of the island during the season. European vegetables are extensively cultivated. The air is clear and light, and the climate remarkably healthy. The anchorage is safe, but a heavy surge rolls on the beach, which sometimes interrupts the communication with the shore for days together. There is no regular tide, and the rise and fall is very trifling. The island is now used as a visiting station and hospital for her Majesty's vessels on the West African station. With the official medical report on the state of the navy for 1876 was given a very comprehensive account of the natural history, &c., of Ascension Island; but by far the most interesting description of it is "Six Months in Ascension," by Mrs. Gill (London, 1879).

ASCENSION, RIGHT. See RIGHT ASCENSION.

ASCETICS (Gr. *askētia*) a term applied to pugilists, wrestlers, and other athletes, among the ancient Greeks, who prepared themselves by abstinence for their combats; subsequently the term was extended to all who practised the severity of virtue, which, among the Pythagorean and Stoic philosophers was called *askēsis*. It consisted in chastity, poverty, watchings, fasts, and retirement. The term used in the latter sense passed into the Christian church, and is very early in its history.

By Oriental and by Greek, the belief had been entertained that in a future was to be found the origin of evil, and that man, possessing a complex nature, which included both matter and spirit, could only rise to true happiness by subduing the body for the exaltation of the soul. The Jews during their stay in Babylon imbibed many of the ideas of their conquerors, and soon after their return these found expression in the ascetic practices of the Pharisees and the Essenes. Confronted with the non-transcendentality of the heathen world, and imbued with the new teaching concerning the life beyond the present, and drawing its ideas both from the traditions of the Jews and the philosophical teachings of the Greeks, the practices of abstinence, celibacy, poverty, and penance soon sprang up among the early Christians, and became part of the teaching of the church. Early in the second century the notion gained ground that while the ordinary conditions of life would suffice for the majority, those who desired to attain to special holiness here and special happiness hereafter must seek it by the path of asceticism, and must renounce marriage and society, the use of meat and wine, and practise penance, fasting, prayer, and contemplation. Such ideas led to the mortifications endured by Paul of Thebes, St. Anthony, and St. Simeon Stylites, and gave rise to the various forms of monasticism. These organized systems of asceticism occupy a large space in the history of the church. They exercised vast influence over both doctrine and practice; but Protestantism, by

reviving the Pauline doctrine of justification by faith, broke off with monasticism for ever. The practice still survives, however, in the Church of Rome, which also enjoins fasting and penance, and enforces celibacy upon the clergy. The tendency to asceticism has also remained with those who embraced the Reformed Faith, and in the rise of Puritanism, the practices of the Quakers, Moravians, early Methodists, and modern Shakers, we see evidences of the deep-seated tendency towards asceticism which exists in human nature when striving to attain a high religious life.

ASCHAFENBURG, a town in the kingdom of Bavaria, delightfully situated on the Main, 25 miles S.E. of Frankfurt. It is surrounded by walls on all sides but that towards the river, is irregularly built, and the streets are mostly narrow, steep, and crooked. The Johannisburg is a handsome palace, forming a large and regular square, with towers to each face. It stands on the highest ground in the town, close to the banks of the Main. Attached to it are a library, picture-gallery, cabinet of engravings, collection of ecclesiastical rarities, and a series of models in cork of ancient temples and ruins. The immediate vicinity of the palace abounds in picturesque scenery. The old Gothic collegiate church, which contains several fine tombs, the massive buildings of the ancient university, the former mansion of the Teutonic order, and the town-hall, are all deserving of inspection. There are eight churches, a lyceum, gymnasium, ecclesiastical seminary, and other schools. The town has been noted for centuries for the excellence of its educational establishments. It has a trade in wood, building stone, tobacco, and wine, and its coloured papers are well known. In 1866 the Prussians inflicted a severe defeat on the Austrians in the neighbourhood of Aschaffenburg, and took 2000 prisoners. The population of the town in 1882 was 12,152.

AS'CHAM, ROGER, the famous "schoolmaster" of Queen Elizabeth, was born in 1515, at Kirby Wiske, near North Allerton, in Yorkshire. His father was house-steward in the family of Scroope. Roger, his third son, was received into the family of Sir Anthony Wingfield, who committed his education, with that of his own sons, to a tutor of the name of Bond; and in 1530 placed him at St. John's College, Cambridge.

He took his bachelor's degree in February, 1534, and on the 23rd of March following was chosen fellow of his college. Ascham had been educated in the doctrines of the Roman Church, but he entered into the controversies of the day, and became a Protestant. He became M.A. in 1537, in his twenty-first year, and commenced to act as tutor. In 1544 he was chosen university orator, in which capacity he wrote the University Letters to the king, and to the great men at court. In 1548, upon Grindal's death, Ascham was appointed to instruct the Lady Elizabeth in the learned languages—a duty which he discharged for two years, but at length took such a distaste to some persons in the Lady Elizabeth's family that he left her a little abruptly, and returned to Cambridge.

On the death of Queen Mary, in 1558, having previously been reconciled to the Lady Elizabeth, now queen, he was constantly at court, fully employed in his two offices, one of secretary for the Latin tongue, and the other of tutor to her Majesty in the learned languages. In 1559 Elizabeth gave him the prebend of Westwarg, in the church of York. He died 30th of December, 1568, and was interred in the Church of St. Sepulchre, near Newgate.

There are three books of Latin epistles and poems by Ascham. His English works were published by the Rev. James Bennet, 4to (London, 1767), with a Life of Ascham prefixed by Dr. Johnson. The best edition is that by Rev. Dr. Giles (London, 1865).

The fame of Roger Ascham rests on his "Schoolmaster," which so great an authority as Dr. Johnson declared "con-

tains, perhaps, the best advice that was ever given for the study of languages." And eminent classical scholars of our day, such as Mr. George Long and Mr. Mayor, are not wanting in assertions that "the 'Scholemaster' sets forth the *only* sound method of acquiring a dead language." When we inquire into Ascham's method we find it is simplicity itself. The child having learnt some rudiments of grammar, the teacher is to take a book, say "Tully's Epistles" (Elizabethans generally called M. Tullius Cicero by his Gentile name Tullius); "and first, let him teach the child, cheerfully and plainly, the cause and matter of the letter" (as we should say, of the epistle), "then let him construe it into English so oft as the child may easily carry away the understanding of it; lastly, parse it over perfectly. This done, then let the child by and by both construe and parse it over again, so that it may appear that the child doubteth in nothing that his master has taught him before. After this, the child must take a paper book; and sitting in some place where no man shall prompt him, by himself, let him translate into English his former lesson. Then showing it to his master, let the master take from him his Latin book, and pausing an hour at the least, then let the child translate his own English into Latin again in another paper book. When the child bringeth it turned into Latin, the master must compare it with Tully's book, and lay them both together; and where the child doth well, praise him—where amiss, point out why Tully's use is better."

The delightful quaintness of the language of this fine old "worthy" lends an additional charm to the keen perception of the true method of acquiring a foreign tongue here set forth. And in another place, after quoting the instance of Dion Prusseus, who "came to great learning and utterance" by reading and following only two books, the "Phredo" and "De Falsa Legatione," he goes on:—"And a better and nearer example herein may be our most noble queen, Elizabeth; who never took yet Greek nor Latin grammar in her hand after the first declining of a noun and a verb; but only by this double translating of Demosthenes and Isocrates, without missing, every forenoon, and likewise some part of Tully every afternoon, for the space of a year or two, hath attained to such a ready utterance of the Latin, and that with such a judgment, as there be few now in both universities or elsewhere in England that be in both tongues comparable with her Majesty."

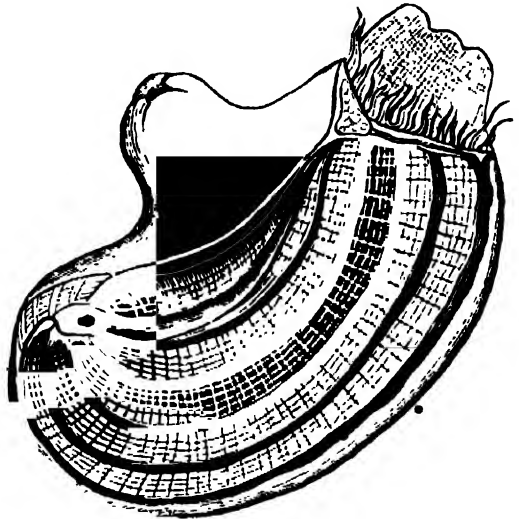
The truth of Ascham's method need not blind us to his ability in concocting so sweetly sugared a compliment to the queen, and so delicate a boast of his own skill. The compliment is all the better for being a fact.

ASCHERSLEBEN, a manufacturing city of Prussia, in the government of Magdeburg, 56 miles by rail from Leipzig, lies near the confluence of the Wipper and Elbe, and on the banks of the last-mentioned river. It has six churches, three hospitals, a gymnasium, and orphan asylum. Root-root is very extensively grown in the neighbourhood, and large quantities of sugar are made in the town. There are also manufactories of woollens, linens, and machinery, and some coal mines are worked in the vicinity. Population, 17,500.

ASCUS (Gr. *ascos*, a bag) are cells occurring in certain fungi, which contain the spores or asexual reproductive bodies in their interior. These fungi form the group called **ASCOMYCETES**, and it is amongst these that modern botanists place the **LICHENS**. The spores are generally eight in number in each ascus.

ASCIDIANS (Ascidioidea, "sea-squirts," &c.) form an order of the **TUNICATA**. In the young state they are like tadpoles, swimming freely by means of their long tails, and in some (Appendicularia) this form lasts throughout life. The adult Ascidian has been compared in shape to a double-necked jar, and to this resemblance it is indebted for its name (from Gr. *askos*, a wine-skin), while the name

"Sea-squirt" has been given from the way in which water is forced through the openings at the "necks." There are two skins, an outer and an inner, which are not joined together except at the openings. The outer skin varies in consistence from a jelly to leather or horn. It contains *cellulose*, a form of starch, which otherwise is almost confined to the vegetable world. The inner skin is largely composed of muscular fibres, and it is by the contraction of this tunic that water is forced out. The two openings are close together. The one through which the food passes leads into a "respiratory sac," which fills the greater part of the cavity of the body, communicating with it by means of several openings. The intestine leads from the bottom

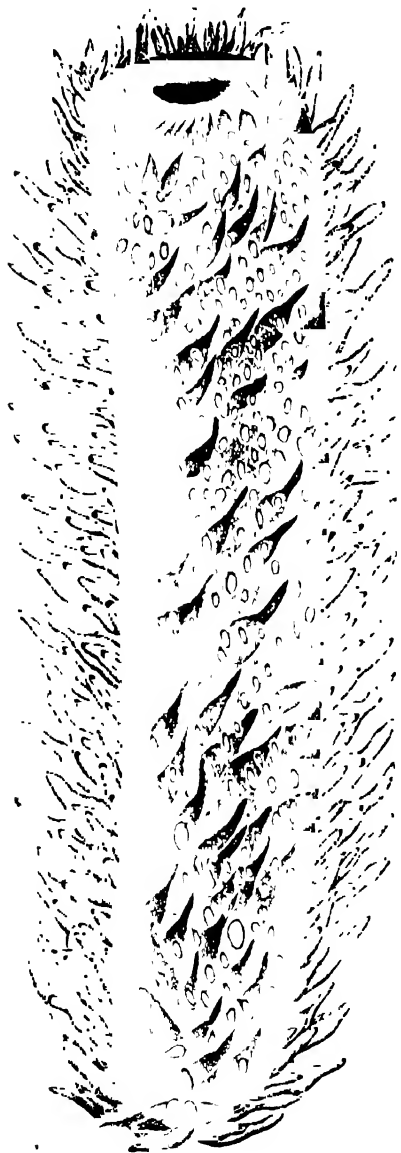


Ascidian, laid open to show branchial sac.

of the respiratory sac into the stomach, and thence by means of the "atrial chamber" or cloaca, to the second opening. There are no eyes. The heart is a simple tube without valves. The blood flows one way for a certain number of contractions, and then in the opposite direction. The nervous system is very simple, consisting of a single nerve knot (or *ganglion*) placed between the two openings, together with nerve-fibres. The most interesting feature in their structure is the presence of a rod-like body in the tail of the young forms, which is comparable to the notochord of vertebrates. In vertebrates this is almost always replaced in the adult forms by the bony axis known as the vertebral column, but in the Ascidians this axial column is found only in the larval stage. It is in Ascidians, then, that evolutionists find the link joining vertebrates with invertebrates.

Most of the species of the genus *Ascidia* are unsightly; but in some the inner coat is seen through the outer transparent coat to be of a beautiful orange or crimson. In the genus *Cynthia* (Plate **ASCIDIA**, figs. 4, 9), the animals are usually embedded in sand, and held in position by the agglutination to their outer coat of the surrounding grains of sand. The Social Ascidians, e.g. *Clavellina* (figs. 5, 6), are very small animals found on stones, shells, and sea weed, adhering by numerous root-like projections of their outer tunic. They occur in groups of several individuals, each having its own heart, respiration, and system of nutrition, but fixed on peduncles or stalks that branch from a common stem, through which the blood circulates in opposite directions. They are such transparent and colourless animals that their internal structure can be seen without

dissecting them. Of the Compound Ascidians good examples are *Botryllus* (figs. 7, 8), *Polyclynum* (figs. 12-14), *Synicum* (figs. 15-17), *Sigillum* (figs. 10, 11), *Distoma* (figs. 1-3). These animals are associated with each other, their tests being fused together, so as to form a common mass in which they are imbedded in one or more groups. They are not, however, connected with one another by any internal union. The *Pyrosomas* (see woodcut) are com-



Pyrosoma 1372

pound, but instead of being fixed they are free and floating on the surface of the ocean. The individuals of which the aggregate mass is composed form a hollow cylinder from 2 to 14 inches long, a half inch to 3 inches in circumference, and open at one extremity only. The individuals composing this curious floating cylinder amount in the adult *Pyrosoma* to several thousands, forming in fact a numerous colony, each little mollusk in its own cell, distinct,

yet inseparably connected with its fellows. They are arranged in whorls, each having two orifices, one on the outside of the cylinder, the other on the inside. By means of cilia (minute hair-like threads) the water is made to pass from the exterior to the interior of the cylinder through the orifices, and the result is a general outflow from the open end of the cylinder, impelling it with the closed end foremost. The *Pyrosomas* are found in the warmer parts of the ocean, and at times are so abundant in the Mediterranean that they have been found to clog the nets of the fishermen. Their delicate and transparent forms, and their elegant tints of colour, render them beautiful objects as seen floating during the day on the tranquil bosom of the sea; but their splendid phosphorescent property, the brilliant light which they give out at night as they glide past the vessel, have made them still more the objects of admiration to voyagers and naturalists.

ASCLEPIADEÆ is an order of plants belonging to monopetalous Dicotyledons. Among these it is known from all others that have a superior ovary, by the single character of its grains of pollen adhering together within a sort of bag, which occupies the whole of the inside of each cell of the anther. When the pollen falls out it sticks to glands of a peculiar character occupying the angles of the stigma. Independently of this circumstance, the anther and stigma adhere firmly together; and the fruit is a very curious body, consisting of two carpels, which, when young, are parallel to each other and united at the point, but when ripe are both on the same plane, pointing in different directions, and shedding a large quantity of seeds, the end of which terminates in long down.

To this order the name of Asclepiadeæ has been given, in consequence of the genus *Asclepias* being the largest which the order contains. It consists of shrubs or herbaceous plants, abounding in an acrid and usually milky juice, and found in their greatest abundance in tropical countries, but rarely in cold latitudes. At the Cape of Good Hope they form a singular stunted deformed vegetation, in the form of the leafless succulent *Stapelia* (Carrion-flowers), the flowers of which are among the most fertile productions of the vegetable kingdom. A great many species of *Asclepias* inhabit North America, and for their beauty are frequently cultivated in Europe, especially the orange-coloured *Asclepias tuberosa*. Their roots are acrid and stimulating, and usually emetic. Their flowers have curious horned processes added to the corolla. Amongst our most beautiful stove-plants are the *Hoyas* and *Stephanotus* of this order.

ASCLEPIAS, a genus of plants, the type of the natural order ASCLEPIADEÆ. Many of the species possess powerful medicinal qualities, and hence the name of the genus, from *Æsculapius* (*Asclepius*), the god of medicine.

The five petals are bent downwards towards the stalk; within these there is another circle, the "coronet," of five boat-shaped processes, with a curved horn-like body projecting from each.

Asclepias decumbens has the property of exciting perspiration without perceptibly increasing the heat of the body. In Virginia it is used in attacks of pleurisy. Dr. J. Gibbons Hunt has shown, by experimenting upon *Asclepias asterias*, what wonderful adaptations exist in the flowers of various Asclepiadeæ for cross-fertilization. The disagreeable odour seems to be peculiarly enticing to flies. Dr. Hunt found them eagerly applying their tongues to various parts of the flowers, and feeding on the exuded juices. But when a fly touched one of five black spots placed alternately with stamens, its proboscis was seized by a structure like a rat-trap. If the fly was a small one it died after struggling for some time, but a large powerful fly would carry off the trap with a pair of pollen masses attached, part of which would cling to the stigma of the

next flower visited. Similar traps occur in *Asclepias cornuti*, *Asclepias incarnata*, and *Asclepias curassavica*.

Asclepias Syriaca (Syrian swallow wort) is a native of Syria and Egypt. The nectaries or leaflets of the corona, like some other species of *Asclepias*, act as fly traps. The sap of this plant is white, and contains a considerable quantity of caoutchouc. The seeds are covered with down, which it was at one time proposed to spin into texture for wearing apparel. It is, however, more adapted for stuffing mattresses and pillows. *Asclepias curassavica* (bastard ipecacuanha) is a native of Curaçoa, Essequibo, and Trinidad. Its roots are frequently sent to England as ipecacuanha. The juice is antihelmintic and styptic. The root dried and powdered acts as an emetic, but not so efficaciously as the root of the true ipecacuanha (*Cephaelis Ipecacuanha*). The roots of *Asclepias prolifera* are also emetic. *Asclepias tuberosa* (tuberous swallow-wort) is a native of North America. The roots are diaphoretic. Many other species of this genus are used as medicines where they grow.

Some of them are handsome border flowers, and worthy of cultivation. They thrive well in peat earth, or a light rich soil of any kind. They may be propagated by dividing the root in the spring, or by sowing the seed.

ASCLEPIUS. See ASCLEPIUS.

ASCOLI PICENO (*Asculum Picenum*), a town in Italy, lying on the right bank of the Tronto, 53 miles S. of Ancona, and 19 miles from the San Benedetto station on the railway from Ancona to Brindisi. It is built on rising-ground, overlooking a fine and fertile plain. Ascoli is the seat of a bishopric and the capital of a province. The cathedral is said to have been built by Constantine on the site of a temple of Hercules. The population in 1882 was 23,225.

ASCOMYCETES are those FUNGI in which the spores are formed in the interior of asci. This group includes the SACCAROMYCETES (one-celled microscopic plants causing fermentation, e.g. yeast), TUBERACEÆ (truffles, &c.), PYRENOMYCETES (to which belongs the ergot-fungus of wheat), DISCOMYCETES (among which are the esculent morels, and the numerous species of peziza, so well known for their beauty of form and brilliancy of colour). Most cryptogamic botanists of the present day also place LICHENS amongst the Ascomycetes, considering that they are fungi parasitic upon algae. See ASCI.

ASCOT, a village in the county of Berks, 6 miles S.W. of Windsor, and 29 from London by South-western Railway, is only noticeable as the place where an important race-meeting is held every year, two weeks after the Epsom summer races, and which always attracts a large and fashionable attendance. The races were founded by the Duke of Cumberland, uncle of George III. The course is one of the finest in the kingdom, and is only 66 yards less than 2 miles in length.

ASEER'GHUR or **ASIRGARH**, a town and fortress in the presidency of Bombay, is situated about 15 miles N. by E. from the town of Burhanpoor, and 7 miles from the station of Chandui, on the Great Indian Peninsular Railway. Aseerghur was the capital of Candeish when that province was subdued by the Emperor Akbar. The fortress crowns the top of a hill 750 feet high, and is abundantly supplied with water. Its importance in the eyes of the natives may be estimated from the fact that it was considered as the key of the Deccan. It surrendered, however, without much resistance to a detachment of General Wellesley's army, under Colonel Stevenson, in 1803. On the conclusion of peace it was restored to Scindia. It made a much better stand in 1819 against a besieging army of 20,000 men, under Generals Doveton and Malcolm; but was at length captured after sustaining a bombardment of sixteen days, with the loss of 213 men killed and wounded on the part of the English. The town stands at the base of the hill whereon the fortress is erected.

ASGARD, the home of the **ASES**, the gods of Norse

mythology. Wodan, the All-father; Thor, the Thunderer; Frigga, mother of the gods; Tyr, Heimdal, and the other Aes, dwell in shining Asgard (the *gard* is simply our *yard*, or the first syllable of *garden*), the "place of the Aes" or gods; whilst midway in the universe lay *Midgard*, the "midplace" or place of men; and beyond lay *Utgard*, the "outer place" or Jotunheim (home of Jotuns, evil-hearted giants and monsters). The home of the heroes who died in battle, VALHALLA, with its 500 gates, was also in Asgard. In the twilight of the gods, the fated RAGNARÖK (Götterdämmerung in German), they will be judged for sins they have committed; and they, the divine Aes, and their brilliant home Asgard are to perish in the last battle with the powers of evil. But not for ever; for on the plains of Ida the purified gods will reassemble, watching with delight a green and blooming purified earth wherein men shall live in peace and goodness thenceforward. Dr. W. Wagner's "Asgard and the Gods" (trans. Macdowall, Lond. 1882); Grimm's "Teutonic Mythology" (trans. Stallybrass, Lond. 1883).

ASH (*Fraxinus*) belongs to the order OLEACEÆ, the olive family. The dry, winged fruit is characteristic of the genus. The trees belonging to this group inhabit various parts of the more temperate regions of the northern hemisphere, both in the Old and New World, but are unknown in a wild state in the northern.

The common ash (*Fraxinus excelsior*) is one of the most useful of our British trees, on account of the excellence of its light, tough wood, and the rapidity of its growth. In its appearance, too, it is singularly graceful for an European tree, often resembling, in its slender stems and thin airy foliage, the acacias of tropical regions. The principal objection to the ash is the injury it does to the plants which grow in its neighbourhood, by rapidly exhausting the soil. In consequence of this few plants will thrive or even grow very near it; and hence the impropriety of the common practice of planting the ash in hedgerows. The extent of its roots may always be distinctly traced by the lighter and paleness of the crops that stand near it.

The principal varieties of the ash are—1, the *weeping ash*, with all the characters of the common wild tree, except that the branches grow downwards instead of upwards, so that, if grafted upon a lofty stem, the head will soon reach the ground and form a natural arbour; this is said to have originated accidentally in a field at Gamlingay, in Cambridgeshire; 2, the *cut-leaved ash*; 3, the *curled-leaved ash*, with very short stunted branches, and deep green crumpled leaves; 4, the *variegated ash*; in this the stems are covered over with a great number of little grayish-brown tubercles.

Besides these, the only European ash that deserves notice is the *Fraxinus parvifolia*, or small leaved ash. Its foliage is much finer and narrower than in the common ash, the leaflets are narrow and finely serrated, the bark is rugged, the growth slow, and instead of the toughness so characteristic of the latter species, the branches are so brittle as to be liable to constant injury from high winds. It is, however, a very beautiful tree, and for ornamental purposes, where size is no object, it should be planted, especially as a single tree.

With regard to the species of American ash, they are not well adapted to this climate, being in general too ill prepared by our short cold summers to bear our winters, and, moreover, injured by spring frosts. Circumstances much to be regretted, because some of the species prove very handsome trees. *Fraxinus americana* is the *white* American ash; *Fraxinus pubescens*, the *black ash*; and *Fraxinus sambucifolia*, the *winter ash*.

The *Ornus Europæa*, or common manna ash, is a small round-headed tree, with leaves resembling those of the common ash. In the summer, when the leaves are full

grown, the trees become ornamented with a profusion of white delicate blossoms, which give them a strikingly beautiful appearance. The species inhabits the southern parts of Europe, especially the woods of Calabria and Apulia, and in those countries flowers in April. *Ornus rotundifolia* is universally distinguished as a second species of this genus, differing in its leaves being much longer. In flowers it is much the same. It is a native of Calabria, and elsewhere in the south of Europe.

These two plants are interesting as producing the sweet laxative substance known in the apothecaries' shops under the name of manna. It is a secretion from the leaves and branches, and is caused by transverse cuts made deep into the bark. Both species yield the substance, but that from *Ornus rotundifolia* is of better quality than the other. The sweetness of this manna is due to a principle, named mannite, differing from sugar in not fermenting with water and yeast.

ASH, MOUNTAIN (*Pyrus aucuparia*), is a well-known ornamental tree, with a graceful form, fragrant clusters of white flowers, and loose bunches of scarlet berries. It is found wild all over Europe and in the north of Asia. A variety occurs with yellow berries. In North America it is represented by a nearly allied species, *Pyrus Americana*, with large copper-coloured berries, and a third kind, *Pyrus microcarpa*, with very small scarlet fruit. The mountain ash is the rowan tree of the Scotch, whose boughs were supposed to be a protection against witchcraft. It forms a hardy and good stock on which to graft the pear tree, when it is desired to dwarf that species. The genus *Pyrus* belongs to the order ROSACEÆ.

ASHANTEE or **ASHANTI**, a country of Western Africa, separated from the Gold Coast by a tract of country inhabited by the Fantees of from 40 to 50 miles in breadth. It lies between 5 and 9° N., and 0 to 4° W., and comprises about 70,000 square miles. The population cannot be stated with any degree of exactness. It has been variously estimated at from 1,000,000 to 3,000,000.

The greater part of the country from the sea coast, as far as 50 or 60 miles to the north of Coomassie, the capital of Ashantee, is still a thick forest, through which travelling is impossible, except along the paths or roads which have been made with great labour in different directions from the capital. Most of the towns and villages are on the line of some of the roads.

Plantain and the yam form the chief article of food in Ashantee. But corn, rice, sugar-cane, and a mucilaginous vegetable called ennuma, somewhat resembling asparagus, are also grown. The plantations are of considerable extent, and very neatly kept. The principal domesticated animals are cows, horses of a small breed, goats, and a species of hairy sheep. Among the wild animals with which the region abounds are lions, elephants, hyenas, wild hogs, deer, antelopes, rhinoceroses, and alligators. Reptiles are very numerous. Serpents of every size not only infest the woods and long grass, but the dwellings of the natives. Scorpions are found as large as a small lobster. The insects are also very numerous. Large, and venomous.

The rainy season in Ashantee may be said to commence with the month of May, but the heaviest rains are about from the middle of September to the end of the following month. In some years there is little or no rain at all during the usual season.

The principal manufacture of the Ashantees is that of cotton cloth, which they weave on a loom worked by strings held between the toes, in webs of never more than 4 inches broad. Silk is sometimes interwoven with the cotton. The cloths which they produce are often of great fineness of texture, and their colouring of the highest brilliancy. They paint their patterns with a fowl's feather. Another of the arts in which they have attained considerable excellence is

the manufacture of earthenware. They also tan leather and work in iron, brass, and gold; the latter metal is found both in mines and in particles washed down by the rains.

The men of Ashantee are very well made. The women are in general handsomer than those of Fantee. Among the higher classes both sexes are remarkable for the cleanliness of their persons, but the lower orders are for the most part very dirty.

The language of Ashantee has an abundance of vowel sounds, few aspirates, and much euphony. Their music is sweet and animated. Among their musical instruments are a flute made of a long hollow reed, with three holes; a box called a sanko, the top of which is covered with an alligator's or antelope's skin, having a bridge risen over it, across which are extended eight strings; immense horns, made of elephant's tusks; and an instrument somewhat like a bagpipe. They have also drums made of the trunks of trees hollowed out; and in their martial concerts the noise is increased by the aid of castanets, gong-gongs, flat sticks, rattles, and brass pans.

The government of Ashantee is a mixture of monarchy and military aristocracy. Polygamy is practised very extensively. Human sacrifices still prevail, but not to quite the same extent as formerly. The system is founded on the idea of piety towards parents and other relatives, the chiefs believing that a deceased person's rank in the next world will be measured by the number of attendants sent after him. Consequently on the death of the king or of any member of the royal house, the "enstom" involves the sacrifice of a large number of victims.

The country between the Gold Coast and Ashantee is occupied by the Fantees, over whom the English on the Gold Coast have for many years exercised a kind of protectorate. On the other hand, the king of Ashantee never gave up his claim to dominion over the Fantees, and to exact tribute from them—a claim founded chiefly on the right of conquest and general superiority. The Ashantee king also claimed certain privileges on the coast. On the departure of the Dutch in 1872 he conceived that he was entitled to possession of the vacated forts, and the measures he took to enforce his supposed right were the origin of the war of 1873-74.

The first time the English were brought into collision with the Ashantees was in 1807, they having invaded and laid waste the Fantee territory, and advanced almost to the walls of Cape Coast Castle. In 1817 a further invasion took place, which caused the greatest distress among the Fantees; and the British, having interfered to protect them, were themselves blockaded in the castle, and with such determination that the government found it necessary, in order to avert the imminent danger which threatened the place, to advance a large sum of money which the king of Ashantee had demanded from the Fantees; with this the invader was contented, and returned to Coomassie. Shortly after this (to the English) somewhat humiliating close of hostilities an embassy was sent to Ashantee, headed by Mr. Bowdich, who succeeded in concluding a treaty of peace and commerce with this powerful African nation.

In 1818 a British consul was appointed at Coomassie, the capital of Ashantee; and a new treaty opened increased means of intercourse between the English and the Ashantees—not without some opposition from the African Company, however, who wished to retain the commerce of the district in their own hands. The Company, the authorities at Cape Coast, and the Fantees all threw obstacles in the way of the treaty; and so little harmony existed that the House of Commons resolved on transferring to the crown all the forts and possessions of the Company. This took place in 1821, and in 1822 Sir Charles Macarthy, the able governor of Sierra Leone, assumed the administration. He, adopting a war policy, soon brought matters to a crisis. War was

declared by the Ashantees, who immediately invaded our territory, and at last, 21st January, 1821, on the banks of the Prah, took place the disastrous battle of Esmacow or Assamcow. Sir Charles Macarthy, though a brave and able commander, underrated both the numbers and skill of his enemy. His force was a handful compared to the 10,000 determined and well-directed foes by whom he was surrounded. His native allies speedily made off, and the brunt of the fight devolved upon about 200 white men, who were attacked in flank and literally cut to pieces. Most of the officers were taken and at once beheaded, and the gallant Macarthy himself, having been severely wounded, was captured and shared the same fate. His heart was eaten by the chiefs, in order that they might obtain a share of his bravery, and his flesh dried and distributed to the chiefs of the Ashantee army, to act as charms. The neighbourhood of Cape Coast Castle and all the Fantee country, from January to July, was overrun with triumphant and now merciless Ashantees, who spared no human life that fell into their hands, and thoroughly devastated and depopulated the country. More than once did they hem in the little garrison of Cape Coast Castle, until it well-nigh fell into their hands, and ultimately it would have done so but for the opportune arrival of the African corps. What British valour could not do, the deadly nature of the climate accomplished; and decimated by the ravages of small-pox, dysentery, and starvation, the enemy was finally compelled to retire.

Little, certainly, had happened in this wretched campaign to impress the Ashantees with any terror of the British arms, and it is not surprising to find them making a fresh incursion in 1826. In September of that year a decisive victory was obtained by the English and their allies at the village of Doodowah, some twenty miles from Accra. The king withdrew what remained of his army, and retired to Coomassie, where after many attempts at negotiation, extending through several years, peace was made in 1831, the king sending one of his sons to Cape Coast as a hostage, together with 600 ounces of gold, as securities for future good conduct.

The Ashantees, however, were by no means demoralized by their check, and their restless and predatory disposition taxed to the utmost the great abilities of Governor George Maclean, who was undoubtedly one of the ablest Englishmen who ever administered British authority in Western Africa. Not only was considerable patience necessary, but a bold front and decisive action were often required to repel threatened invasions. In 1853 an Ashantee army of 20,000 men, without any declaration of war, crossed the Prah and invaded British territory. Colonel Hill, the then governor of the Gold Coast, gathered his whole force of about 120 men, rallied to his support a large number of confederated chiefs and Fantees, and with a battery of small guns made a bold dash for the Prah. Cutting his way through the bush he surprised and prepared to attack the Ashantees, previously giving them twenty-four hours to recross the river. The enemy, astonished and demoralized by so sudden a display of energy, instantly retired, and to a man recrossed the Prah into their own country.

It was not until 1862 that any very serious trouble again occurred. In that year the Ashantee monarch demanded the extradition of an old chief who had taken refuge at Cape Coast, and of a runaway boy slave. The latter was refused, and also the former, in the absence of evidence of his supposed guilt. The protectorate was then overrun with plundering invaders, who spread themselves out like a scourge over the country. The British governor asked for troops and full powers to strike "a final blow at Ashantee power." This, however, the home government declined, and left Governor Pine to fight the matter out as he could. He assembled his forces and cleared the protectorate; but

while preparing, on the other side of the Prah, to march to Coomassie, the rain set in, pestilence swooped down on the little force, and it took what was left of it three months to make its way back to the coast, the whole matter being a dreary failure.

An uneasy peace followed this unsatisfactory war, marked by two important political transactions which indirectly precipitated the struggle of 1873-74, viz. our exchange of territory with the Dutch in 1867, and our assumption of the whole of the possessions of Holland on the Gold Coast in 1872. Angry at our taking Elmina, which they claimed for Ashantee, the enemy crossed the Prah, and in January 1873 came sweeping everything before them to within sight of Cape Coast Castle and Elmina, and encamped within a short distance of the forts some 50,000 strong. They were held at bay for some time by the bravery and tact of some marines, seamen, and negro troops, and the home government presently resolved to make war in such a manner as effectually to deter, if possible, the Ashantees from ever again invading the protectorate. In September, 1873, Sir Garnet Wolseley was despatched with a large staff of selected officers to conduct the operations. Led by these officers the native troops and West Indian regiments made several well-directed blows at the Ashantee position. On the 7th November Sir Garnet attacked the enemy at Abakrampana, and inflicted such a defeat that the Ashantees at once commenced to retire backwards to the Prah. In the meantime a request for British troops had been despatched, it being found that little dependence was to be placed on the native allies. The 23rd and 42nd Regiments, and a battalion of the Rifle Brigade, were at once sent out, and with them a naval brigade, and immediately on their arrival a prompt advance was made. The Ashantees fled in all directions until they reached Amoaful, about 22 miles from Coomassie, where they were much assisted by the impenetrable character of the bush, and where they made a most determined resistance on the 31st January, 1871. Every inch of the bush was disputed, and very sagacious military tactics were displayed by the Ashantees. By midday on the 1st February the determined perseverance of the British troops, and the continuous rain of Snider bullets, told upon the enemy, who then began suddenly to retire, after having inflicted considerable losses upon our troops. Bequa, a large town near Amoaful, was destroyed on the 1st, and on the 2nd February the army pushed forward against a diminishing resistance to Agemahu. On the 3rd the general encamped at the river Ordah, where messages of peace were received from the King of Ashantee, the object evidently being, as on similar previous occasions, to gain time. The king had now taken the field in person, and sitting on a golden stool at Ordahsu, declared he would cut off the head of any chief who ran away. His position, however, was on the 4th stormed by the 42nd Regiment, he himself beat a hasty retreat, and the 42nd dashed upon Coomassie, which they entered triumphantly the same day. As all the efforts of Sir Garnet Wolseley to induce the king to return and treat for peace completely failed, on the evening of the following day (5th February) Sir Garnet determined upon withdrawing his troops and destroying Coomassie. The decision to withdraw was strengthened by the fact that tornadoes had set in, and the passage of the rivers would be rendered difficult by delay. The town was accordingly set on fire, the mines in the palace fired, and on the morning of the 6th the homeward movement of the British troops commenced. Five days after Sir Garnet Wolseley had left Coomassie, Captain Glover, who had assembled a force from the eastern tribes of the Gold Coast so as to make a simultaneous march upon Coomassie, reached and marched through its still smoking ruins with 4000 men; and the king, fearing greater calamities, sent

1000 oz. of gold to the general, and sued for peace on any terms. Of the five great towns of Ashantee, three—viz. Coomassie, Beegua, and Fomona—were destroyed, Juahin was occupied, and the chief of the fifth town, Mampon, and Amanquatia, the Ashantee commander-in-chief, were both killed.

ASHBOURNE, a market town in Derbyshire, on a tributary of the Dove, with a station on the North Staffordshire Railway, 153 miles from London by the Midland line, or 147 by the North-western, is situated in a rich valley 13 miles N.W. from Derby. The place is prosperous, in consequence of its being the centre of a fine agricultural district; but the manufactures carried on are not very important. There is an ancient church, restored by Sir Gilbert Scott, with a spire of such beauty and lightness that it is called "The Pile of the Peak." The town also has a grammar school and a market hall, with an assembly room over. There are many good residences in the vicinity, which contains some very beautiful scenery. The population of the town in 1881 was 3185; of the parish, 2095. The Royalists were defeated by the Parliamentarians at Ashbourne in 1644.

ASH BURTON, a town in Devonshire, 18 miles S.W. from Exeter, and 263 from London by the Great Western Railway. It is situated in a pleasant valley, through which runs a tributary of the Dart, and contains a handsome old Gothic church, with tower 90 feet high, a public library, guildhall, and market house, and an endowed grammar school. There are some tin mines and many slate quarries in the neighbourhood. Formerly Ashburton returned two members to the House of Commons, but it was deprived of one by the Reform Act of 1832, and the other in 1868. Ashburton was the birthplace of the celebrated lawyer Dunning, who became Lord Ashburton, and of William Gifford, the editor of the *Quarterly Review*. The population of the parish in 1881 was 2391.

ASH BURTON, LORD, ALEXANDER BARING, was the second son of Sir Francis Baring, of the famous commercial house of Baring Brothers & Co., and was born 27th October, 1774. In early life he was actively engaged in the service of the house in the United States and Canada, and in 1810 he became the head of the firm. He sat in the Liberal interest for Taunton in 1812, and subsequently represented that place, Callington, and Thetford in various parliaments between 1812 and 1832, when he was chosen for North Essex as a moderate Conservative, his political opinions having undergone a change. He held the post of master of the Mint and president of the Board of Trade under Sir Robert Peel, on whose retirement from office he was raised to the peerage under the title of Lord Ashburton. In 1842 he was appointed special ambassador to the United States, to settle some boundary disputes that had arisen, and in the month of August in that year concluded the Washington treaty, by which the United States gained some advantage. He was an opponent of free trade, but took an active part in carrying out the penny-post system proposed by Sir Rowland Hill. He died 13th May, 1848, and was succeeded by his eldest son William Bingham Baring, who was born 1799, educated at Oriel College, Oxford, and elected member for Taunton, 1836. In 1841 he was appointed secretary to the Board of Control; in 1845 paymaster-general of the forces, and treasurer of the navy. In 1869 he was elected president of the Geographical Society. He died 23rd March, 1864.

ASHBY-DE-LA-ZOUCH, a market town in Leicestershire, 16 miles N.W. of Leicester, and 118 from London by the Midland Railway. Originally it was called Ashby only, but received the addition of De-la-Zouch from the Norman family of La-Zouch, who were made lords of the manor in the reign of Henry III. On the south of the town are the ruins of Ashby Castle, in which Mary Queen

of Scots was imprisoned for a time. This castle was built in 1480 by William Hastings, ancestor of the earls of Huntingdon, who was created baron of Ashby-de-la-Zouch in 1461. The famous passage of arms described in Sir Walter Scott's "Ivanhoe" is stated to have taken place at Ashby-de-la-Zouch. The present town is handsome and well built; and there is good accommodation for those who resort to it as a watering-place. The Ivanhoe Baths, erected in 1826, are highly medicinal, and are often recommended in cases of scrofula and rheumatism, as the waters contain bromine. St Helen's Church is an ancient and handsome building; it contains the tombs of the Huntingdon family, including that of Selina, countess of Huntingdon, foundress of the sect named after her. There are five other churches and chapels, a town-hall, and a grammar school, with several exhibitions to Emanuel College, Cambridge. Some manufactures of leather, hats, hosiery, and malt are carried on; and a fine clay, suitable for fire-bricks, tiles, &c., is found in the neighbourhood. There are also coal and iron mines in the immediate vicinity. The population of the town in 1881 was 4536; of the parish, 7165.

ASHES, the remains of anything burned, whether of vegetable or animal origin, and to a certain extent of mineral bodies also.

Vegetable Ashes.—Woody fibre, termed chemically *lignin*, is composed of oxygen, hydrogen, and carbon; it constitutes nearly the whole of all vegetable matter, and it is almost entirely dissipated when burnt. Two of its elements, by combining with the oxygen with which they were already united, and a fresh portion acquired from the atmosphere, form new compounds. The carbon of woody fibre is the element which remains longest unacted upon, and on this circumstance the preparation of charcoal from wood depends. When, however, this carbon has been totally dissipated by the long-continued and combined action of heat and the oxygen of the air, there remains only a small quantity of ashes composed of mineral ingredients derived from the soil. Ashes vary in composition according to the nature of the plant, the soil in which it grows, and of the manure used upon it.

The substances usually contained in the ashes of land plants are potash, soda, lime, magnesia, silica, the oxides of iron and of manganese, chlorine, carbonic acid, sulphuric acid, and phosphoric acid. Alumina occurs rarely, and sometimes oxide of copper has been met with. Very frequently more than one-half of the ashes of vegetables consists of carbonate of lime. The quantity of ashes varies, not only according to the soil, age, and aspect of the plant, but also in different parts of the same plant, from $1\frac{1}{2}$ to $3\frac{1}{2}$ per cent. of its weight, after drying in the air. Sometimes the ashes amount to 4 or 5 per cent., and in the bark of the oak to 6 per cent.; the quantity and quality of the ashes also vary in the same kind of wood from accidental circumstances. The soluble part of wood-ashes consists of the alkaline sulphates, carbonates, and chlorides, while the insoluble matter is chiefly composed of carbonate of lime, and probably of magnesia, phosphate of lime, and phosphate of iron.

The incineration of wood is a most important operation; from its ashes are obtained the immense quantities of impure potash, and the carbonate called *pearl ash*, imported from America and other countries. The sap of plants contains also other vegetable acids, as the oxalic, citric, tartaric, malic, &c.; and the salts which these form with potash are decomposed by heat, and yield the carbonate.

The ashes of land plants yield principally the salts of potash; those of marine plants afford a large quantity of soda salts, and especially the carbonate. There are several varieties of *Salicora* and *Salicornia* cultivated on the coasts of Spain which, when full grown, are cut, dried,

and burnt in trenches; the resulting ashes are called *barilla*, and are imported in the state of hard gray porous masses. *Kelp* is the ash of some varieties of sea-weed, especially of the *Fucus saccharinus* and *Fucus vesiculosus*; it contains carbonate of soda, which used formerly to be often procured from it.

Coal ashes are extremely various both in their appearance and composition. Thus much of the coal of the north of England, under common circumstances, burns to a cinder, which is a mixture of the ashes of the coal with some carbonaceous matter requiring rather a high temperature to burn it, on account of its being enveloped by incombustible matter. The coal of Somersetshire burns to red ashes, evidently coloured by peroxide of iron; those of the Staffordshire coal are nearly white. The quantity of ashes yielded by different kinds of coal varies considerably; according to Kirwan, Wigan coal contains 1.57 per cent. of ashes, Whitehaven coal 1.7, and Swansea coal 3.33 per cent. They consist principally of silica and alumina, with small quantities of lime, sometimes magnesia, and also peroxide of iron; but they do not contain either the chlorides, phosphates, or alkaline salts found in wood-ashes. *Peat ashes* differ chemically from both the other kinds.

Animal ashes resulting from the burning of bones and other animal solids, consist principally of phosphate of lime, with traces of salts of lime, magnesia, and soda.

Mineral ashes, such as those of Vesuvius, are grayish in colour; they are tasteless, and consist of alumina, oxide of iron, nitrate of ammonia, sulphate of lime, potash, copper, manganese, lime, and charcoal. The ashes ejected from Etna are also of a gray colour, and in fine powder; they contain sulphur, sulphates of lime, copper, and alumina, and several other mineral ingredients.

ASH'DOD or **ASDOD** (*Asdos* of the Greeks) is situated on the shores of the Mediterranean, about 9 miles N.E. of Ascalon, and 21 S. of Jaffa. David probably got possession of Ashdod when he "took Gath and its towns out of the hand of the Philistines" (1 Chron. xviii.) It was taken by the Assyrians about 714 B.C., but afterwards fell into the hands of the Egyptians, after sustaining, according to Herodotus, a siege and blockade of twenty-nine years in the reign of Psammetichus, during which it must have suffered greatly, for Jeremiah calls it "the remnant of Ashdod." The temple of Dagon was destroyed by Jonathan Maccabeus, and the town burnt during the wars between Alexander Balas and Demetrius. It seems never to have recovered its former splendour, though A. Gabinius, the Roman governor of Syria, subsequently ordered it to be rebuilt.

ASHFORD, a market town in the county of Kent, is pleasantly situated on a gentle eminence near the river Stour, 14 miles S.S.W. of Canterbury, and is an important junction station on the South-eastern Railway, 56 miles from London. A new community has rapidly grown up in the neighbourhood of the railway station, and this district is called *New Town* or *South Ashford*. It owes its prosperity principally to the establishment here of the South-eastern Railway Works, where the company's locomotives and carriages are manufactured and repaired. A good deal of business is, however, still carried on in the old town—many of the houses in which are well built and handsome. The principal street is about half a mile in length. The public buildings include a fine Gothic church, erected in the reign of Edward IV., with lofty perpendicular tower, and many interesting monuments; a new church at South Ashford; a free grammar school, founded in 1638 by Sir Norman Knatchbull; several chapels, corn exchange, Whitfield Hall, and a cottage hospital. There is a neat cemetery about a mile to the north of the town. The population of Ashford in 1881 was 9693.

ASH'LAR is a term applied in masonry to rough stones

as they are taken from the quarry, and also to the dressed stones used for the facing of walls, which may be either plain, tooled, or rusticated.

ASH' MOLE, ELIAS, an eminent antiquary and herald, the founder of the museum which still bears his name at Oxford, was the son of a saddler of Lichfield. He was born 23rd May, 1617. He studied law, and in 1638 became a solicitor in chancery. In February, 1641, he was sworn an attorney of the Common Pleas. In 1645 he became one of the gentlemen of the ordnances in the garrison at Oxford, and then commissioner and afterwards receiver and registrar of the excise at Worcester. In the midst of these employments he entered himself of Brasenose College, Oxford, where he applied himself to the study of natural philosophy, mathematics, and astronomy, and where his acquaintance with Sir George Wharton led him into the absurd mysteries of astrology and the friendship of Lilly and Dee, the latter of whom he assisted in publishing a work on the philosopher's stone. In 1658 he published a treatise on the philosopher's stone, entitled "The Way to Bliss." In 1659 the younger Tradescant made over to him the museum of curiosities, in Lambeth, London, which the two Tradescants, father and son, had been long accumulating. Upon the accession of Charles II. Ashmole rose into considerable favour, and received substantial marks thereof from the king.

In 1682 Ashmole gave to the University of Oxford the collection of rarities which he had received from the Tradescants, together with such additions as he had made to them; to which he afterwards added the donation of his manuscripts and library. This is still called the Ashmolean Museum.

Ashmole spent the latter part of his life in retirement. He died 18th May, 1692, in the seventy-sixth year of his age. His body was interred at Lambeth.

Besides the work already noticed, and the "Theatrum Chymicum Britannicum," which were published during his life, Ashmole left large collections in manuscript.

ASHTON-IN-MACKERFIELD, a township in Lancashire, 20 miles from Manchester, and 190 from London by the North-western Railway. Iron manufactures, especially of locks, hinges, bolts, screws, and tools, are carried on, and there are numerous collieries in the parish, which also contains much good land. There is a grammar school, founded in 1588, a parish church, and chapels for all denominations of dissenters. The population in 1881 was 9825.

ASHTON-UNDER-LYNE, a manufacturing town and municipal and parliamentary borough in Lancashire, 6½ miles E. of Manchester, and 188½ miles N.W. by N. of London. It is on the north bank of the river Tame, which here divides the counties of Lancashire and Cheshire. Dukinfield forms a suburb of Ashton across the river, and is united with it by a bridge.

Ashton is a thriving place, and on the whole well laid out and well built. The parish church is large and ancient. There are also some modern churches and places of worship for dissenters. The court-house is a handsome building, with a theatre and a concert-room over it. Spacious baths, constructed by the corporation, were opened in 1871; and in 1873, through the munificence of Lord Stamford and several of its public spirited inhabitants, the town acquired a noble public park of nearly 50 acres. The waterworks belong to the corporation.

The chief business of Ashton is the cotton manufacture, introduced towards the close of the eighteenth century. The goods produced are chiefly ginghams, muslins, and calicoes. Altogether there are over 100 mills in the town. There are also establishments for bleaching, dyeing, and calico-printing, and for the manufacture of hats, machines, and bricks, and in the neighbourhood are some very exten-

sive collieries. The town is admirably situated for trade, having communication by means of canal and railway with all parts of the kingdom. Its growth has consequently been rapid. In 1821 the population was only 9222; in 1841, 22,689; in 1861, 31,886; in 1871, 37,389; and in 1881, 37,040. The population of the parish in 1881 was 75,310. One member is returned to the House of Commons. The number of registered electors in 1885 was 6000.

The manor of Ashton formerly belonged to the family of Assheton, one of whom—Sir John de Assheton—was held in great esteem by Edward III. It afterwards passed to the Booths, from whom sprang Baron Delamere, created by Charles II., his son being made Earl of Warrington by William and Mary. The Earl of Stamford and Warrington, whose descendants still hold it, acquired it by marriage in the middle of the eighteenth century. The ancient manor hall is still standing. A field in front, called "Gallows Meadow," now built over, was used by the feudal lords for executions. A curious ceremony, called "riding the black lad," takes place on Easter Monday. It consists in carrying the effigy of a man in black armour on horseback through the streets to the Old Market Cross, where it is shot at. It is said to be the outcome of the tyranny of a certain Sir Rauf de Assheton. The parish of Ashton from time immemorial has been separated into the four divisions of Ashton town, Audenshaw, Knott Loes, and Hartshead.

ASH-WEDNESDAY. This, which is the first day of Lent, had formerly two names: one was *Caput Jejunii*, "the head of the fast," the other was *Ash-Wednesday*, so called from the ancient ceremony of blessing ashes on that day, with which the priest signed the people on the forehead in the form of a cross, adding this admonition, "Memento, homo, quid cinis es, et in cinerem reverteris" (Remember, man, that thou art ashes, and shalt return to ashes). The ancient discipline of sackcloth and ashes on Ash-Wednesday is at present supplied, in the English Established Church, by reading publicly on this day the curses denounced against impenitent sinners, when the people are directed to repeat an "Amen" at the end of each declination. (Wheatley "On the Common Prayer," 8vo, 1722, p. 227; Brady's "Popular Antiquities," vol. i. p. 79.) Brady, in his "Clavis Calendria," says the primitive Christians did not commence their Lent until the Sunday now called the first in Lent. Pope Felix III., in the year 487, first added the four days preceding the Old Lent Sunday, to complete the number of fasting days to forty, of which it now consists.

ASIA, the main mass of the great continent of the Old World—the East, the Levant, the Oriental or Morning Land, in contrast to the Occidental or Evening Land of Europe in the west—is of surpassing interest as the cradle of the human race, and of all religion, wisdom, and civilization. Its enormous area (17,300,000 square miles) spreads out over nearly five times the extent of the western continent of Europe, and forms a third of all the land of the earth's surface. Carl Ritter supposes that the name Asia extended to the continent from that of a people living on the north side of the Caucasus, whom Ptolemy calls *Asaii*. In the process of time, as the country east of these people became known to the Greeks, the name of *Asaii* or *Asia* became co-extensive with their discoveries, till at length it was customary to designate by it one of the great divisions of the globe. Others derive the name from a Hebrew or Assyrian root which signifies the "east," or "the rising sun." Before describing the various geographical features of the continent, we purpose briefly to sketch the steps by which it has become known to western nations.

Asia as known to the Greeks and Romans.—From the earliest records of European history, the Homeric poems, we learn that an intercourse existed before the war of Troy

between the inhabitants of Europe and Asia. But as far as we can infer from our authorities, it was more of a hostile than a pacific nature. Commercial exchange seems to have been nearly confined to a few Phœnician vessels which visited the islands of the Archipelago and some ports of Greece. The establishment of Greek colonies in Ionia, and the Greek navigation of the Black Sea, gradually led to a knowledge of Western Asia. About 550 B.C. a large number of separate states were incorporated into the extensive Persian empire, which comprehended nearly all the countries between the Mediterranean Sea on the west, and the Belur-Dagh on the east, the Caspian on the north, and the mountains which border the valley of the Indus on the south; and as many of the Greek colonists were placed in close communication with this empire, geographical knowledge of the interior rapidly extended.

Before the time when Herodotus wrote (484 B.C.) the Persian empire had become stationary. Accordingly we find that the geographical knowledge of the Greeks, for more than a century, did not advance beyond the ancient boundaries of that empire. But as the intercourse, both hostile and pacific, between the Greeks and Persians had during that period considerably increased, their knowledge of the different provinces composing the Persian empire was also enlarged. By the subsequent conquests of Alexander the remoter provinces of the Persian monarchy, of which a great part till then had only been known in such general outlines as those given by Herodotus, and by the vague information of individuals, were at once opened to the Greeks. Besides his advance towards the north-east, Alexander crossed the Indus and four of the rivers which traverse the Punjab, and advanced to within a short distance of the banks of the Jumna and the valley of the Ganges. His exploration of the valley of the lower Indus, the voyage of his admiral Nearchus along the coast, and the transference of the commerce of Tyre to Alexandria, together with the spread of the geographical knowledge formerly possessed by the Phœnicians, all tended to make Asia better known to Europeans. Very soon after the death of Alexander, Egyptian vessels from the ports of the Red Sea began to visit the shores of Malabar, and to venture as far as Cape Comorin and the island of Ceylon (called Taprobane by the Greeks). But the information thus acquired related chiefly to the harbours and sea coasts.

The successors of Alexander, being almost continually engaged in wars among themselves, did not add largely to the then existing knowledge of Asia. At a later date, when the Romans extended the boundary of their empire to the Tigris and the Euphrates, their military expeditions being carried on in countries previously known, could add very little to the store of information. We ought, however, to make an exception with respect to the Caucasus. In their wars with Mithridates, king of Pontus, the armies of the Romans passed the boundaries of the then known world, and arrived at Mount Caucasus, with whose extent and situation they became acquainted, though they did not enter the valleys which lie in its bosom. In proceeding further to the shores of the Caspian Sea, they got information of a commercial road through Bactria, by which the countries on the south of the Caspian Sea carried on an active commerce with India; and soon after another route was discovered, which led over the high table-land of Upper Asia to the Seres, or Chinese, probably the road which still passes through the town of Kashghar. The growing taste for Asiatic luxuries led to much intercourse along such of the routes as were then known.

The knowledge which the ancients acquired concerning the geography of Asia is embodied in the works of Strabo, of Pliny, and of Ptolemy of Alexandria, the last of whom raised geography to a science by basing it on astronomical principles. From these writers it is evident that only those countries into which the Macedonian con-

queror had carried his arms were known with any degree of correctness as to their general features, and that beyond their knowledge was limited to a few places traversed by commercial roads, and to the harbours. Besides these works, the "Periplus" of Ptolemy, and another probably written in the second century, and attributed to Arrian, give a more particular description of the coast of eastern Africa and of Asia. Another "Periplus" likewise, which certainly is the work of Arrian, contains a brief coast description of the *Pontus Euxinus* (Black Sea). As to the geography of Northern Asia, few additions were made after the time of Herodotus and Alexander. In some respects there seems to have been a retrograde movement, as Herodotus knew the Caspian to be a lake, which Strabo believed to communicate with the Northern Ocean. Ptolemy in his map restored the Caspian to its true character of an inland sea, but he placed its length from east to west instead of from north to south, as Herodotus had done.

Asia unknown in the Middle Ages.—For many centuries after the birth of Christ little was done to advance European knowledge of Asia. The Byzantine or eastern Roman empire, and the Sassanide dynasty in Persia, effected something in this respect; but the rise of the Saracenic power checked all advance for a time. The intolerance by which the Mohammedans in the first two centuries of the Hegira (commencing A.D. 622) were distinguished, interrupted every sort of commercial intercourse with India as well as with Upper Asia. Circumstances, however, arose which led them to abate their intolerance and to adopt a more enlightened policy. Science began to be cultivated, arts to flourish, and commerce to be promoted among them. Geography had its full share of the advantages resulting from this favourable change. As every true Mohammedan was bound by his religious tenets to visit the Kaaba of Mecca at least once in his life, travelling became more frequent among the Arabians than it ever has been in any other nation; and as the love of letters increased and became more general, the number of their geographical works, travels, and voyages increased in the same proportion. Ibn Haukal, Edrisi, Abulfeda, Ibn el Wardi, and Ibn Batuta, all Arabian geographers or travellers, have left descriptions of various parts of Asia, written between the tenth and the fourteenth centuries.

The Arabs seem also at an early period to have renewed the commercial intercourse with India by the Red Sea and the Gulf of Persia, and to have soon extended their navigation beyond the extreme limits attained by the Greeks of Alexandria. There are extant two works on the countries about the seas of China, written, as it is thought, by Ibn Wahid and Abu Seid about the end of the ninth century. But the Arabs did still more for geography by establishing it as a science on mathematical and astronomical principles—thus following up the work of Ptolemy. The Calif Al Mamun (813–833) ordered a degree of the meridian to be measured, and this task was executed by the three brothers Ben Shaker in the great plain to the north-east of Damascus, between Palmyra and Racca, on the banks of the Euphrates. In subsequent attempts at the projection of maps, the Arabs soon became sensible of the want of actual astronomical observation. This led them to the erection of observatories, and to the completion of astronomical tables. Two works of this kind still exist—one composed about A.D. 1345, in the observatory built at Maragha, near the Lake of Urumiyeh, and the other in 1449 at Samarcand.

Two hundred years before the Christian era the Chinese were anxious to collect geographical information concerning the extensive provinces and tributary kingdoms of their dominions; and they have continued this work to the present day. Besides the information thus collected by means of the administration of the different provinces, the emperor was in the habit of sending ambassadors, who were in-

structed to gather useful information concerning the countries they were sent to, and to include it in their reports of the embassies. The reports were afterwards deposited in the archives of the government. From such materials the geographies of the Chinese empire were composed and published in print, the art of printing having come into general use among the Chinese in the tenth century. These works contain very abundant information concerning Tartary, Corea, Tibet, Turkestan, and Bokhara, and even valuable notices on Siberia, Persia, and India, as well as on Siam, Tonkin, Java, Formosa, and Japan. The Chinese language being now more studied by Europeans than formerly, these geographical works have become well known. Moreover, apart from purely mythological accounts, the Chinese possess the most ancient reliable historic records of any country in the world.

Europeans began to renew their acquaintance with the countries of Asia on the shores of the Mediterranean in the eleventh century by pilgrimages, and soon afterwards by the crusades (1096–1272) undertaken for the delivery of the holy sepulchre from the Infidels. The navies of the Italian republics accompanied these expeditions; and the citizens of Pisa, Florence, Genoa, and Venice thus acquired extensive knowledge of the East. About the middle of the thirteenth century the Mongols conquered Russia, and their increasing power led to a spread of geographical knowledge. Pope Innocent IV. and King Louis IX. of France suggested the plan of diminishing the power of the great Mongol empire and its warlike army against the Mohammedan princes in Western Asia, their implacable enemies; but this object did not seem practicable to the projectors of this plan, unless they could previously convert these barbarians to the Christian faith. For that purpose some friars were sent to the court of the great Khan: John di Plano Carpini in 1246; Father Ascelin, a Dominican, in 1248; and William Rubrighis or Ruysbroeck, in 1254; and though they did not succeed in the main object of their mission, the information which they acquired of the countries through which they passed made Europeans for the first time acquainted with the immense extent of those regions formerly called by the vague name of Scythia, which from that time became known as Mongolia or Tartary. At a somewhat later period (from 1275 to 1292) the Venetian Marco Polo resided at the court of Kublai Khan, the Mongol emperor; and as he enjoyed the favour of the emperor in a very eminent degree, and was well acquainted with the most important languages spoken by the people of the country, he was frequently sent on missions to the remotest provinces of the Mongol empire, which were so distant from one another that he was often obliged to travel six months before he arrived at the place of his destination. In all his missions and travels he had been in the habit of keeping a journal, and of entering what appeared to him most worthy of being recorded. On his return to Italy his incredulous countrymen importuned him by unceasing questions, and at length he resolved to make an extract from his journal of the most remarkable objects which he had seen or heard of. This he did, and the result shows how extensive and accurate was his knowledge of Asia. See MARCO POLO.

After the time of Marco Polo the number of travellers in Asia increased; but as none of them traversed any considerable part of it, they commonly tried to enliven their works by fables or inventions of their own, or by exaggerating the information which they had obtained by intercourse with the natives. Of this description are the narratives of the monk Hayton, the monk Oderico di Portenau (about 1318), and Sir John Mandeville (about 1358). Somewhat more trustworthy were those of the Spanish ambassador Gonzalez Clavijo, who in 1406 was sent to the court of the famous Timur at Samarcand; the German adventurer, John Schildberger, who served in the

armies of Bajazet, the Turkish emperor, of Timur, and Shah Rokh, from 1100 till 1127; and especially the Venetian Josaphat Barbaro, who travelled (1136-71) in the countries east of the Mediterranean Sea, and carefully collected many remarkable facts. But all these travellers, though they brought back to Europe some useful information, contributed little or nothing to the extension of knowledge as to parts which had previously not been known at all, or only very imperfectly.

Progress of Modern Discovery in Asia.—Vasco de Gama arrived in 1498 at Calicut, on the coast of Malabar, and the Portuguese pushed their discoveries in these seas with such activity and zeal that, in the course of less than half a century, they had explored them as far as Japan. Their first efforts to establish a commerce were directed to the coast of Malabar; and as the Arabs or Moors, who then carried on a very active trade with these countries, tried every means to exclude them from these parts, and to embroil them with the numerous sovereigns among which this coast was divided, they were soon obliged to have recourse to arms, and to enter into alliance with some of the native powers. In a few years they had acquired a complete knowledge of the whole coast, from Cape Comorin to the Bay of Cambray, and its rich emporiums Surat and Barroach. As early as 1509 they made several settlements on the southern coast of Gujarat as far as Din, which then had a considerable commerce with Persia and Arabia, and they erected some fortresses on this coast. The following year Alonzo Albuquerque took from the Moors and in the reach of the Deccan the famous town of Goa, which soon became the centre of all the Portuguese dominions in India, and the seat of the viceroy and colonial government. The Portuguese now made advantageous treaties with the petty sovereigns along the whole coast of Malabar, and also obtained a footing in Ceylon. In 1511 Albuquerque conquered Malacca; and between that date and the year 1523 the Portuguese made themselves acquainted with Coromandel, Orissa, Bengal, Chittagong, the Burmese peninsula, and numerous islands in the Indian Ocean.

In 1516 the Portuguese, under Ferdinand Perez, arrived at the coast of China, in the Gulf of Canton; and after some difficulty and delay they obtained the island of Macao as a settlement. In 1542 they reached as far as Japan, and if their object had only been commerce they might have greatly enriched themselves; but the spirit of conquest much retarded their commercial enterprises. They exhausted their strength in forming settlements both in the Old and New World, and many of their Asiatic possessions gradually fell into the hands of the Dutch. These latter did not materially increase the geographical knowledge of the countries in which they settled. They published, indeed, a few descriptions of some of their colonies, and the natural productions, especially of the plants and shells; but these works were generally defective in geographical information. The most important communication belonging to this period was furnished by the German naturalist E. Kämpfer, who, in the capacity of Dutch physician, resided in Japan from 1681-92, and gave a good description of that country.

In the fifteenth century the northern part of Asia, which had not been known, either to the ancients or moderns, suddenly emerged from the obscurity in which it had hitherto been involved. The sovereigns of Russia, who for more than two centuries had been dependent on the Tartar princes of the family of Gengis Khan, obtained the full sovereignty of their country in 1461; and under various princes, adventurers, and voyagers the Russians became acquainted with the vast region of Siberia, even to Behring's Strait, before the end of the seventeenth century. The discovery and conquest of Siberia were completed by Peter

the Great, who took possession of Kamtchatka in 1696. As illustrative of this part of Asia, the records of travel by Pallas at the end of the eighteenth century, and of Wrangel, Middendorf, Erman, and Humboldt during the first half of the present century, are still of value. But systematic modern exploration in Siberia, combining geology and zoology with geography, began in 1854 with the operations of Schwarz, Schmidt, and others, in the upper basins of the Lena and Amur rivers. This work was followed up by the expedition under Prince Krapotkin (a good geologist) to the same region in 1873, and by Poyarkow's explorations of the Amur. The distinguished Swede Nordenskiöld, in 1879, voyaged along the northern coast of Asia, and besides accomplishing the great discovery of the North-east Passage, made some useful rectifications of the Siberian coast line. Maacke, Schrenck, Boshuev, Radde, and many other travellers, continued the work of exploration, until the Russians had quite a geographical literature and an excellent series of maps regarding Siberia and Kamtchatka. Nor have Englishmen been idle in this vast and inclement region. The Rev. Henry Lansdell described several parts of Siberia after a journey of 8000 miles from the Ural to the Pacific in 1880. Atkinson graphically illustrated the Altai Mountain and the Siberian plains; Kennan published the story of his tent-life in Siberia; and Rush, an account of reindeer, dogs, and snow-shoes; while Seeborn descended the Yenisei to the Arctic Circle in the prosecution of ornithological studies.

In their Caucasian territory the Russians have carried out extensive trigonometrical surveys, and published a large map. The Caucasus has also been visited by English travellers—Moore, Grove, and Freshfield, the latter of whom ascended for the first time the summit of Elbrus, and gave an excellent narrative of his travels.

The proceedings of the Russians in Central Asia have, within recent years, been the means of shedding a flood of light on those formerly inaccessible regions. Various causes led to the military occupation of Khokand, Samarcand, Bokhara, and Khiva, all of which districts are practically annexed to the Russian empire, which now extends from the Caspian along the northern borders of Persia, Afghanistan, Chinese Turkestan, Mongolia, and Manchuria, to the Pacific. The vast extensions of the Russian empire that have taken place have resulted in opening up and making better known great areas in Central Asia of surpassing interest. It is now possible to present, under their respective names, a definite view of the present condition of countries in this part of Asia, respecting which the haziest ideas formerly prevailed. And setting aside all political aspects of the question, there can be no doubt of the benefit to this most interesting part of the world which has followed from Russian occupation of Central Asia. Mr. O'Donovan, whose fascinating story of his sojourn in Merv and other parts of Central Asia was published in 1882, very clearly showed how the desert was encroaching upon scanty oases in every direction, because ruthless plundering hordes of savage Turkomans and other tribes make cultivation next to impossible. Where it was attempted on the outskirts of an oasis, small stone towers had to be erected here and there in which the reaper (always armed) might take refuge when the marauder hove in sight. And here the would-be peaceful cultivators were often besieged until their crops were plundered, unless help arrived betimes. Cities like Samarcand and Bokhara, of intense historic interest, were regarded as sacred, and strangers fanatically shut out. Colonel Stoddart and Captain Conolly, who ventured to the latter place on a political mission, were barbarously murdered; and Dr. Wolff, who in 1845 went to ascertain their fate, narrowly escaped sharing it. Arminius Vambery visited both places in 1860, but only at the risk of his

life, and disguised as a dervish. All this is now changed; and indeed, in 1880, General Kauffman boasted, with some justice, that a traveller could wander at will through any part of "Russian Turkestan" with far more safety than he could through the Russian Caucasus, though the latter had been occupied three times as long. Still more true did Kauffman's boast become in 1881, when, after Skobloff had captured their last great stronghold at Gok Tepe, the leading Turkoman tribes admitted the utter futility of further resistance to the advance of a civilized power, and sent representatives to St. Petersburg to acknowledge the supremacy of the Czar.

Discovery in south-western Asia has progressed more slowly. The Turks obstructed research in Asia Minor, but the Persians offered more facilities, and hence we have many valuable narratives relating to that country. Such information is contained in the travels of Pietro della Valle (1614-26), Adam Olearius and Albrecht von Mandelsloh (1633-39), John Thevenot (1652), John Baptist Tavernier (1665), and especially in those of John Chardin, the court jeweller of the King of Persia and of Charles II. of England, who discovered the ruins of Persepolis; and of Francis Bernier, the physician of the Emperor Aurangzebe, who first gave some information on the valley of Cashmere. Gasparo Balbi, a Venetian jeweller, made a journey to India (1579-88), by the route of Aleppo, Bir, the Euphrates as far as Felingia, and Bagdad. Rauwolf, in 1571, also descended the Euphrates from Bir.

Much good exploring and surveying work has been done in Persia of late years by officers of the British government; and by the labours of Moirer, Malcolm, Porter, Kinneir, Layard, Goldsmid, Ferrier, Bellew, C. E. Stewart, and Sir Henry Rawlinson, our knowledge of a country so primeval in its associations, and yet so fraught with modern interest, is fairly complete.

In the sixteenth century the Jesuits obtained a footing in China; and by degrees some of them found opportunities of traversing various parts of the Chinese empire and of the countries of central Asia. Thus Father Ben Goës travelled (1607) from India through Kashghar, Yarkand, and the desert of Gobi to the great wall of China. Other Jesuits succeeded in insinuating themselves so far into the favour of the great Emperor Kanghi that some of them always accompanied him in his expeditions and travels, or were sent on certain missions. By these means they acquired a considerable knowledge of China and the countries dependent on it, as Mutchuria, Corea, and even of the great desert called Gobi, as well as of the manners, character, and institutions of the inhabitants of those countries. The observations of the Jesuits were published. But the greatest service which they rendered to geography was their map of China, which was made, under the authority and at the expense of the Chinese government, by the friars Bonvet, Regis, and Jartoux, between 1708 and 1718; and after having been corrected by the friars Felix d'Arceha, Espinha, Haflerstein, and Gaubil, was published at Peking by the authority of the Emperor Kienlong in 1760 in 104 sheets. The great imperial geography, entitled "Taïtshun-yehoung-tchi," written by the order of the Emperor Kienlong, may be considered as a commentary on this map.

Within the last half century the great celestial empire has been the scene of many wonderful explorations. As in the last century, Roman Catholic missionaries were pioneers in this venturesome task. Two Frenchmen, Gabet and Hue, led the way by toilsome marches of more than 7000 miles right through China proper and Mongolia between 1845 and 1850. Gabet died from infirmities caused by his sufferings during this journey, but Hue survived to relate their proceedings in one of the most entertaining books of travel ever written. The Russian military officer, Prejevalsky, the most scientifically trained, persevering, and capable

traveller who had up to this time entered Mongolia, went over much of the same ground in 1870, and made a valuable contribution to Chinese geography. For China proper another French missionary, David, in 1874, gave to the public the results of his ten years of travel, extending over some 6000 miles. The Chinese nowadays offer the most liberal facilities to Christian missions for evangelistic tours, and many missionaries, English and French, are availing themselves of these opportunities. One of the best examples of travel in China is the work of the German Richtshofen, who, after covering the country with a network, as it were, of his journeyings, published in 1877 the most scientific, systematic, and elaborate of the books ever written on that country. Numerous Englishmen have made use of the advantages they possess in China for geographical exploration. Blakiston minutely determined the course of the lower Yang tse-kiang; and within the last few years, partly with the view of opening up trade routes, Cooper, Margary, Ney Elias, Gill, and Baker have courageously and laboriously passed from China across forbidding regions straight through to India or to Burmah—two of them, Cooper and Margary, having been killed in the course of these travels.

The geography of India—that country which, since it first became known, had always most excited the curiosity of the learned, and attracted the speculations of the merchant—was longer involved in obscurity than almost any part of Asia. Up to the middle of the last century its coasts were very imperfectly determined, and very little indeed was known of the interior of the country itself. A few travellers, as Thevenot, Tavernier, and Bernier, had given some information about a few districts and routes, but it was extremely scanty. The true geographical knowledge of these countries began in the Decan with the wars of the East India Company and the French (about 1710), and in Hindustan with the conquest of Bengal (1757). From this time its progress was extremely rapid. The expeditions against Hyder Ali and Tippoo Saib, the wars with the Pindaries and the Mahattas, and the capture of Pondicherry and Ceylon furnished large accessions to the geographical knowledge of India. The travels and memoirs of Forbes, Buchanan, Heyne, Wilkes, Percival, Davy, Marsden, Valentia, Heber, Malcolm, &c., supplied much additional information. Numerous memoirs, either inserted in the Transactions of the Asiatic Societies of Calcutta and London or published separately, have illustrated the geography, geology, natural history, or antiquities of some special district or place. It may be truly said that India, which a century since was less known than almost any other country of equal extent, has since that time been so well explored that there is no country respecting which we have better information. In fact, the trigonometrical survey suggested by the Duke of Wellington, commenced soon after the siege of Seringapatam, and only recently completed, is without a parallel for extensiveness and accuracy. From the base of the Himalaya range down to the southernmost cape near Ceylon the British territories are delineated and depicted, not only mountain by mountain and river by river, but also village by village, even field by field, and are as minutely known as the most highly civilized districts on the globe, or the best managed estates in Europe.

Northward from India, beyond the Himalayan range, lies the elevated plateau of Tibet, of which little was till lately known—partly owing to the natural difficulties of access to it, partly to the intense jealousy of the Chinese government respecting the intrusion of foreigners. Lassa, the capital of the country and the holy city of Buddhism, was guarded from the intrusion of strangers much the same as Mecca is from the polluting footprints of the unbeliever. No explorations had been made since the political missions

of Bogle and Turner in the eighteenth century, which were despatched by Warren Hastings, the governor-general of India, and the journey of Manning to Lassa. In 1870, however, the French missionary Desgodins published the result of some extensive journeyings in Tibet; and during the years 1867-70 some native surveyors, trained by Major Montgomerie, R.E., made several explorations in Tibet and Central Asia, with the most successful results. During the latter half of 1868, and part of 1869, three agents were at work on different portions of the country to the north of the Himalayan watershed—one in the great plain of Tibet, one in the country to the east behind Mount Everest, and a third in the countries between Cabul and Kashgar. The first was a pundit. He reached Rudok, the capital of North-west Tibet—which has never been visited by a European—and then advanced nearly due east for 630 miles, of which 500 were new ground, over a plateau averaging more than 15,000 feet above the sea. This great plain either runs into, or parallel with, the great desert of Gobi. It is called the Aksai Cheen, or White Desert of China, and is believed to extend right up to the Great Wall of China at the city of Loochoo. The pundit visited some gold mines in Tibet, and obtained detailed descriptions of several other gold fields. Salt lakes also abound, and as to borax there is enough to supply the potteries of the world.

The second explorer went to the Eastern Himalayas, and made a route-survey 1190 miles in length, advancing in one way 640 miles and returning by another 550 miles. This man managed to penetrate behind the mighty Mount Everest. Unluckily, the Lassa officials stopped him on the Zingimalin, and his thermometers were broken, but not before he had determined twelve heights and taken twenty-nine latitudes. His new routes supplied the information necessary to connect the discoveries of former explorers in this region, and enabled a new map to be constructed of the Eastern Himalayas.

The third explorer was a Mussulman known as "the Mirza." He went from Cabul to Badakshan, thence by the upper valley of the Oxus to the Sirikul, or Victoria Lake, and thence to Tashkent, where he was stopped and placed in open arrest. He was now in the territory of Yakob Beg, then Ataligh Ghazee of Eastern Turkestan, and made his way, closely watched, over the mountains to Kashgar. He was allowed to use his instruments all the way. He returned to India by Yarkand and the Karakorum Pass.

In 1875 a young semi-Tibetan, who had also been trained by Major Montgomerie for geographical investigation, reached the Tibetan town of Shigatze, crossed the Brahmaputra, and ascended the Sampo, its most northern affluent, to its source, thus ascertaining the exact position of the watershed of the Brahmaputra valley, which he crossed at an elevation of 17,000 feet above the sea. He reached the great lake Tengri-nor, and achieved a geographical discovery of the first importance; for that lofty sheet of water had never before been visited by any explorer connected with Europeans, although placed vaguely on European maps on the authority of Chinese cartographers. Projevalsky and other careful explorers subsequently went over much of the ground traversed by these native travellers, and besides confirming the accuracy of their observations, added much information of interest.

Yakob Beg, the "Ataligh Ghazee of Eastern Turkestan," above referred to, was an Usbeg leader of great courage and sagacity, who in 1863 headed a revolt of Mohammedans in Chinese Turkestan, a large country to the north of Tibet. Succeeding in his enterprise he became ruler of the state thus newly created, and gave a liberal welcome to explorers from India, Yarkand and Kashgar, his two principal cities, were accordingly visited by Sir Douglas Forsyth, Mr. Shaw, Projevalsky, and others; and

geographical information of high interest was obtained. The Chinese, however, who had never relinquished their claim to the country, slowly gained upon it year by year; and on the death of Yakob Beg in 1877 the authority of the Celestials was completely re-established, together with much of the old Chinese exclusiveness.

With all, however, that has been accomplished by the intrepidity and devotion of explorers ever since the days of Marco Polo, there yet remains much to be done before the old world—the world by far the longest known to civilized nations—is opened up in anything like proportion to the new. We have not in this brief sketch attempted to show the results, but only the general progress of discovery. The knowledge that has been attained will be incorporated in our description of Asia, and of the various countries included within this vast continent under their several headings.

General View of the Continent: its Extent, &c.—Asia, the largest of the great land divisions of the globe, and the most populous, takes the lead also in diversity of surface, variety of organic forms, and historical antiquity. It is nearly five times the size of Europe, considerably exceeds that of Africa and Europe taken together, and surpasses the joint masses of North and South America. Within its limits are found more than half of the whole population of the earth, yet so little proportion is there between this vast number of inhabitants and the magnitude of their dwelling place, that Europe is three times more densely peopled. The immense region contains the loftiest elevations and the deepest depressions of the terrestrial surface, with the most varied and highly-developed forms of animal and vegetable life; while from its plains, valleys, and hills have been distributed to other parts of the world the most valuable of the domesticated quadrupeds, the choicest fruits, and those food-plants which are most important to the daily sustenance of mankind.

The mainland of Asia is situated entirely in the northern hemisphere, but it makes a very close approach to the equator (within 100 miles), and the insular appendages advance southward of the line. In the opposite direction it passes far into the depths of the north polar zone. While continuous with Europe, and attached to Africa by the slender Isthmus of Suez (itself severed by the canal), its eastern extremity is only separated 36 miles from the shores of America by the narrow channel of Behring Strait. The other boundaries are the Caspian and Black Seas, the Archipelago, Mediterranean, and Red Sea, on the west; the Indian Ocean on the south; the Pacific on the east; and the Arctic on the north. These ocean-basins advance to some extent inland, forming minor seas, fringed and dotted with numerous islands. The most important are the Arabian Sea and Bay of Bengal, southern; the China, Yellow, and Japanese Seas, with that of Okhotsk, eastern, each of which has its subordinate gulfs. On the northern side the indentations are numerous, but upon an inferior scale, and have more the character of river estuaries than oceanic inlets.

Generally speaking, Asia is distinguished by great compactness. It has therefore a smaller extent of coast line in proportion to its magnitude, though reckoned at 35,000 miles, with fewer maritime advantages than the other continents, Africa alone excepted. The main mass forms a trapezium, from which there are huge projections, those on the southern side corresponding somewhat to the projections of Southern Europe. But there are striking differences between Asia and the other great masses of land, both as respects horizontal and vertical configuration. Europe may be compared to a body with very prominent limbs; Africa to a body without members; while Asia has arms of enormous magnitude, with a body preponderating conspicuously in its dimensions. Glancing

at America, its extension is principally in the direction of the meridian, but that of Asia is somewhat proportionate in latitude and longitude. The highest mountains of America are in the western coast region, its most extensive lowlands are central; while the highest mountains of Asia are towards the centre, and its low-lying levels are maritime.

The superficial area of the continent, not including the islands, is 17,300,000 square miles, equal to one-third of the entire land of the globe. Its extreme points are all maritime. Cape Romania, in Malacca, forms the southern extremity, and Cape Chelyuskin, in Siberia, the northern, respectively in latitudes $1^{\circ} 20'$ and $78^{\circ} 20' N$. The western limit is Cape Baba, on the shore of Asia Minor, in longitude $26^{\circ} 4'$ east; and the eastern, a head-land on Behring's Strait, is defined by the meridian of 170° west. From north to south the greatest extent amounts to about 5100 miles, following the meridian of 100° . This is slightly exceeded by the linear distance, east and west,

along the parallel of 40° ; but a diagonal line drawn from north-east to south-west, or from Behring Strait to the Isthmus of Suez, measures not less than 6700 miles, or more than a quarter of the distance round the globe, and intersects no considerable body of water except the southern part of the Caspian. An enormous number of insular appendages closely adjoin the mainland. They occur chiefly in groups and chains, are variously of volcanic or coralline formation, and have an aggregate area equal to one-fifth of the extent of Europe. The Northern Ocean contains the desolate and highly fossiliferous cluster of New Siberia. The Aleutians, stretching out in a curving line towards America, the long and narrow tract of Sagalien of the Kurile and of the Japanese series, Formosa and Hainan, are off the eastern coast. Off the southern shores of the continent lies Ceylon, with the Andaman and Nicobar, the Maldivé and Laccadive groups. Westward, in the Mediterranean, are Cyprus, Rhodes, and other dependencies of the Lesser Asia. But the grand insular examples are



Lowlands of Western Asia.

on the south-east, where the large masses of Sumatra, Java, Borneo, Celebes, the Philippines, and a world of contiguous isles, compose the East Indian or Malayan Archipelago. This splendid region—the “gardens of the sun” in eastern speech—divides the basin of the Indian from that of the Pacific Ocean, and leads by a series of huge stepping-stones to within hail of Australian lands.

The interior of Asia embraces lowlands, plateaux, chains and groups of mountains, developed upon a scale in harmony with its colossal proportions.

The Lowlands of Asia.—The Lowlands of Asia lie

The first is the great Chinese Lowland, a wide alluvial plain on the eastern shore of Asia, along the Pacific Ocean, beginning at the great wall on the north, and extending nearly to the tropic; it enjoys a temperate climate, and exhibits the most advanced state of agriculture, the most extensive system of canals, the most active internal navigation, and is the richest and most populous granary in the whole world.

The second is the Indo-Chinese Lowland, which comprehends the kingdoms of Cambodia and Siam. It unites the advantage of being situated S. of the tropic with that

and with very little rain. In these plains the great empires, by which the history of this division of the globe is so distinguished, have attained their greatest power, and continued for the longest period of time. The extensive low plains are six in number; they are different in their natural character, and in no way connected with one another.

one plateau or southern mountain. In this there are two widely different regions. Immediately east of the Indus the plain which reaches from the Arabian Sea to the parallel of $31^{\circ} N.$, is almost entirely occupied by the scantily inhabited Indian desert, with its strange succession of sandy ridges without a single stone, sometimes rising as high as 200

feet above the valleys between them, called the "Thur" and the "Put," a region of hard level soil, abruptly bordering on the former. The eastern half of the Indian plain, in the basin of the Ganges, may be compared to its miniature representative, the plain of Lombardy, in Southern Europe; for the broad alluvial lowland of the Ganges is at once the most fertile, the most cultivated, and most densely peopled region of India. The delta mouths of the Ganges, however, like those of the Po, have their unhealthy swamps, the muddy jungle covered "Sundubans."

The fourth is the Lowland of Syria and Arabia, embracing the great plain of Mesopotamia, once the seat of high civilization, irrigated from the Euphrates and the Tigris by innumerable canals, and cultivated like a great garden, so as to support a large population, round the cities of Nineveh and Babylon, but now appearing as a great dry steppe, green with vegetation only in the wet season; over it the hot winds are ever extending the sands of the Arabian desert, and nomadic herdsmen and plundering Bedouins have taken the place of busy citizens.

The fifth is the Lowland of Turkestan, which is entirely continental, not being in contact with any part of the ocean, and only watered by inland seas, the Caspian and the Lake of Aral. It extends from Filet nearly to the banks of the Volga. Its extensive plains, which are scantily watered, are a kind of mean between sandy deserts and agricultural soil, and their surface is mainly formed of gravel. They are what are commonly called *steppes*—plains covered with grass, and without wood, in which are scattered, like oases, a few tracts of cultivable ground. Such a country is the natural abode of nomadic tribes, who, having little attachment to their native soil, are prone to wander in search of more fertile regions. From the Caspian to Bokhara large tracts of the plain are occupied by deserts of drift sand, such as the Turcoman Desert and the sand-waste of Kizilkum, between the Oxus and the Jaxartes; but where the rivers cross these, and wherever the waters can be drawn off for irrigation, the dreary expanse of the desert is relieved by the brilliant green of rich vegetation, as in the gardens round the cities of Samarcand and of Khiva, which seem, in contrast, the very image of paradise. It is about the parallels of 48° to 50° N. lat. that the deserts give place gradually to the region of grassy steppes, the most southern portion known as the Kizil Steppe, being occupied by hordes of the nomadic Kirghiz, whose wealth is in their herds of broad-tailed sheep and their camel-herds. Herds of antelopes also graze over these plains.

The sixth is the interior or Siberian Lowland, which is by far the most extensive of all, occupying more than half the area of the Lowland of Asia taken together, and extending along the Polar Sea the whole length of the continent from the Ural Mountains to the Pacific Ocean. Though the country is extremely vast, it derives little advantage from this circumstance, on account of the extreme coldness and sterility of the northern and most extensive portions. From about 55° N. we enter the forest zone, with a growth of pine and fir and birch, sheltering a numerous species of mammals, and stags, bears, foxes, and marten. Here the Russian and Samoyede hunters come from their winter far camps. Approaching the Arctic Circle the trees thin out, and give place at last to the bare, open tundra region, over which winter holds sway during the greater part of the year. In the tundras there are the Samoyede huts and fish, and hither in the short summer the wanderer comes to crop the short mosses, the only vegetation that can ripen in the rigorous climate. Such are the features that along the coast in winter it would be difficult to tell where land ceased and the ice-covering of the Arctic began, were it not for the line of drift timber marking the shore.

Highlands of Asia.—The physical features of this vast continent, the courses of its rivers, the direction of its chains of mountains, the various climates of its different regions, and the relative situations of its different members or limbs, will be best understood by a brief description of the great central plateau of Asia. The central regions of the continent rise into a vast and highly elevated plain, which extends some thousands of miles in every direction, and is flanked on all sides by high and precipitous mountains, which overlook the surrounding countries, and some of which rise to the height of 29,000 feet. Neither for height nor extent is there any other plateau on the globe to compare with this great table-land, which has a mean altitude of from 6000 to 15,000 feet, and above which tower the Himalayas, Kuen Lun, Thian Shan, and Altai ranges. The mighty barrier of the Himalayas, sweeping round from Afghanistan to Burmah in a graceful curve, which presents its convex side towards the Indian Ocean, incloses the vast central plateau on the south. On the north it is hemmed in by the Altai, with its eastern projections, the Sayan, Yablonovon, and other Siberian ranges; on the east by the less continuous Yungling, Inshan, and other Chinese ranges; on the west the Himalayas and Altai, through the Karakorum, Hindu Kush, Thian Shan, and Altai, close round the Great Pamir, here interlacing in the focus of the whole continental mountain system.

Within these stupendous rocky walls, the central table-land, occupying an area of more than 3,000,000 square miles, or nearly four-fifths of the entire area of Europe, presents several clearly defined divisions, differing greatly in their relief, and also in their physical aspect, one from the other. (1) The most remarkable of these divisions is the Great Pamir, or Bam-i-Dunda—that is, "Roof of the World," as it is not inaptly termed by its inhabitants; and which forms the nucleus of the whole Central Asiatic highland system. Here converge the Hindu Kush and Himalayas from the south-west and south-east, the Kuen Lun from the east, the Thian Shan from the north-east, while the plateau itself merges westwards in the snowy highlands and icefields about the sources of the Zaraphan, between the Oxus and Jaxartes valleys. The Pamir is 30,000 miles in extent, with a mean elevation of at least 15,000 feet, culminating in the east with the Tagharum (25,500 feet). (2) The great Tibetan plateau, between the Himalayas and the Kuen Lun, maintains a mean elevation of 18,000 to 20,000 feet, and is the loftiest expanse in the world. (3) But beyond the Kuen Lun, and between that range and the Thian Shan and Altai ranges, there is an abrupt descent to the vast region of the Gobi Desert, which is scarcely more than 4000, and which sinks westward in the Taimur or Lob Nor depression as low as 2000 feet above sea level.

On most of its sides the great Central Asian plateau we have described is extraordinarily inaccessible, the passes being steep in the extreme, and culminating in ridges 18,000 to 20,000 feet above sea level. Towards Siberia the Altai passes are easier, and on the north-east, between Mongolia and China, there are several passes, the historic outpourings of the Mongol hordes, and which are universally remembered by the Chinese as the openings through which their invaders in past times rushed like the great river in flood, or the avalanche sweeping along the boulders and debris to the destruction of the valleys beneath. It is not, indeed, the least interesting feature about this great central plateau that it is the home of conquering races, whence warrior hordes poured during several centuries over nearly all Asia and a large part of Europe. In its physical aspects the plateau is remarkable for (1) a mountain system which, in its various extensions, dominates the greater part of Asia, and includes stupendous ranges with

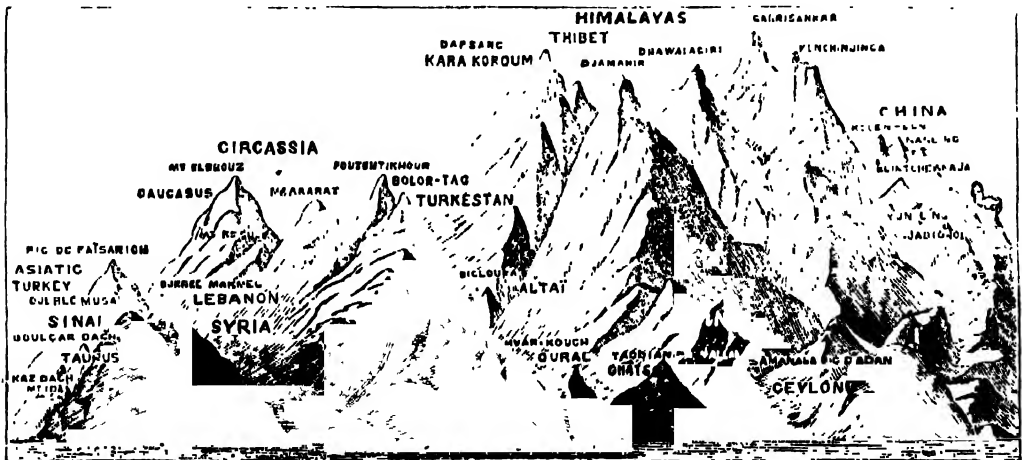
the loftiest peaks in the world; (2) a lacustrine system, comprising lakes of which some are saline, while others have fresh water, and of which many are situated at great altitudes—Lake Victoria, in the heart of the Pamir, for instance, being at an elevation of 14,000 feet; (3) and as comprising the sources and permanent supply of all the great Asiatic rivers, which, passing from the plateau, flow through densely populated regions and help to sustain the most numerous families of the human race.

Speaking more broadly, it may be said that the great mass of the Asiatic highlands, including the central plateau already defined, extends through the whole continent, from the Mediterranean on the south-west round to Behring's Strait on the north-east. Midway nearly, the plains of North-western India and of Southern Turkestan approaching one another, the highland is compressed to its narrowest, so that two unequal portions of it, an eastern and a western, are united by only the isthmus like range of the Hindu Kush, from the opposite sides of which tributaries flow to the Indus and to the Oxus.

The mass which rises east of the Hindu Kush has its southern border marked by the giant walls of the Himalaya,

which reach higher above the sea level than any mountains on the globe, and have the highest peak of all, Mount Everest, 29,002 feet. South-eastward it runs out into the fan-like ranges which form Further India; eastward it gives off the Nan-ling and Pe-ling mountains of China; north-eastward its edge is defined by the Kiangnan Mountains, and, continuing their direction, the Yablonoi and Stanovoi Mountains extend away to the Behring's Strait. Towards the Siberian lowlands its limits are formed by the mountains which inclose Lake Baikal, by the Sayan Mountains, the Altai, and the Tarbagatai and Alatau ranges further west; and at the head of the Oxus the circuit is completed by the great plateau land of the Pamir Steppe.

The division of the highland which rises west of the Hindu Kush isthmus opens out first into the broad plateau lands of Afghanistan and Persia, the outer edges of which are very clearly defined. On the northern side the ranges continuing the Hindu Kush along the south of the Turkoman Desert, run west to join the Elburz range (Mount Demavend, 18,464 feet), which falls abruptly to the southern coast of the Caspian. Towards the Indian plain the Suliman range forms the edge of the plateau; and towards



Mountains of Asia.

the Indian Ocean, the Persian Gulf, and the plain of Mesopotamia, the parallel chains of South-western Persia, the Kohrud, the mountains of Fars and of Kurdistan, give a distinct and well-marked limit. Where the northern and southern border ranges of the Persian highland approach one another, west of the Southern Caspian, they form the mountain land of Armenia, with Ararat (17,000 feet) for its central point. Farther west the highland again opens out in the broad plateau of Asia Minor, which has the Taurus ranges for its southern buttress. From the heights of Western Kurdistan, also, a line of height runs southward along the coasts of Syria, to form the Lebanon; and the continuations of its double chain are the plateaus of Judea and of Moab, east and west of the remarkable fissure of the Jordan, and the Dead Sea, the deepest hollows of the earth's surface.

Besides the main mass of the Asiatic highland in its two great divisions above sketched, several isolated highlands are noticed. One of these nearly fills the desert land of Arabia, rising at once from the Red Sea coasts and descending gradually towards the Mesopotamian plain. The highest part of this plateau is in that part of its edge which faces the Gulf of Oman, where the summit of Jebel Akhdar (the "green mountain") is not far short of 10,000 feet in height. Another isolated highland is that of the Deccan in

Southern India, marked out between the Western and Eastern Ghats, or "passes," by which it is ascended from the Arabian Sea coast, or from that of the Bay of Bengal; and by the Vindhya Mountains along its northern edge, facing the plain of the Ganges. A third important detached mass is that of the Sikhote Alin or Tatar Mountains, and their southern prolongation the Shan Alin, and the high mountains which give its form to the peninsula of the Corea. The valleys of the Amur and of the Liao-ho separate this mountain region almost completely from the main mass of the Asiatic heights.

Lastly, there is the chain of volcanic heights which forms so many remarkable loops along the eastern or Pacific front of the continent, from Kametchatka (Klitchev volcano, 15,000 feet), through the Kurile Islands to Japan (Fusi Yama volcano, 12,235 feet), thence through the Liu-Kiu Islands to Formosa (Mount Morrison, 10,800 feet), and onwards through the Philippines to Borneo (Kini-Balu, 13,698 feet), Sumatra, and Java, which has a greater number of volcanic cones than are to be found on any land of similar extent on the earth.

To obtain a general idea of the character of the great highland mass of Central Asia, we may suppose ourselves to be travelling from the plains of India northward to those of Siberia. From the cultivated plain of the Ganges we

should reach first the dreaded forest belt of the "Terai," along the base of the mountains. Having passed its swamps, leaving the tropical vegetation of the lower slopes of the Himalaya, we should find ourselves, at a height of 4,000 or 5,000 feet, in forests of oak, walnuts, and chestnuts, like those of Southern Europe. Higher up the face of the Himalaya, from 8,000 to 10,000 feet, this forest is replaced by rhododendrons, and above the latter height to 12,000 feet by pine trees. Above 15,000 feet vegetation becomes scanty, though plants have been gathered up to 19,000 feet above the sea. Then follows the snowy region, which gives its name (the "abode of snow") to this highest range in the world, and which sends down great glaciers, in comparison with which those of the Alps are insignificant. The passes, always difficult, lead through the snowy zone, the lowest of them being as high as the most elevated of the Alpine passes of Europe. Having crossed the crest of the snowy range, we would enter the bare region of Tibet, the highest plateau land of the world, where the herdsman tends his flocks of long-haired shawl-wool goats, his sheep and yak oxen, and where grain can only be cultivated in the deeper valleys. This is also the country of the wild horse, and of the great wild sheep or argali. Descending the northern edge of the Kuen Lun from the Tibetan plateau, into the central basin of the Tarim, we should reach the Takla Makan Desert, which is a continuation of the sandy Gobi, with bordering steppe land next the bases of the mountains on each side. Ascending the opposite range of the Thian Shan, and entering Zangaria, we should find ourselves again in a more favoured Alpine region, with cultivable valleys and wood reaching up to the snow limit, and grassy Alps to which the Kirghiz resort for summer pastures. Lastly, descending to the lowland, we should enter the pine forests of the Siberian plain.

Rivers and Lakes.—The snows and glaciers of the Central Asian plateau are the sources of magnificent rivers, which, though not equal in length and volume to those of the western world, owing to the different disposition of the mountains, make a very close approach to them, while the lakes are remarkable for their number, size, and varied attributes. At the same time vast tracts of the surface are waterless wastes. In the northern half of the continent the great streams have a very languid current in their mean state, owing to the vast extent of country between the central highlands in which they rise, and the Arctic Ocean to which they flow. So slight is the declination of the surface that Tobolsk, on the Irtysh, though 550 miles from the sea, is little more than 100 feet above its level. For the same reason the rivers overflow their banks, and spread out in wide inundations, upon the melting of the snows which deeply cover the whole of their basins in winter; and in that season they are useless as navigable channels, being strongly frozen. In Southern Asia the rivers are generally rapid, having a considerable fall, consequent on the comparative proximity of the highlands from which they descend to the ocean. They are subject to an annual or a semi-annual rise, from the melting of the snow in spring towards their sources, and from the deluges of rain which periodically visit the countries they traverse. The largest rivers flow outward to the Indian and Pacific Oceans, or to the Arctic Sea; but within the continent there is an immense area from which no rivers escape to the ocean.

The greatest rivers are those which flow northward over the Siberian lowlands to the Arctic Sea. The Obi, 2700 miles in length, richest in fish of all the rivers of Siberia, affords a great summer thoroughfare for all Western Siberia through its main channel and that of its tributary the Irtysh. The latter gathers its head-streams in the Issan Lake, 1500 square miles in area and 1918 feet above the sea, in a valley of the Altai. Its channel is twice flooded, first when the snows of the plains melt in May,

and again in July when the mountains in the south send down their supplies, inundating the land; the plain then presents the appearance of a waste of water, broken only by the tree-tops which rise above its surface. At its mouth it freezes in October, and the ice does not break up till May.

The Yenisei is a still larger river, ranked by Russian geographers after the Mississippi. Its head-waters, or rather those of its main branch the Angara, collect in the great Lake Baikal, which is the greatest fresh lake in Asia, 15,000 miles in area, regularly traversed in summer by steamboats, and from November till April by sledges over its ice covering of 4 feet in thickness. The Selenga, the main feeder of the Baikal, has an upper reservoir in the Kos-gol, in the mountains south-west of Irkutsk, also a great expanse, more than 100 miles long and 40 wide. Till quite recently the traffic on the Yenisei by summer steamer and winter sledge was confined to Siberian interchange alone, but now the practicability of the navigation of the Kara Sea from Western Europe has been demonstrated, and this part of the north-east passage will doubtless be the line of an immense summer trade in future, to bring the abundant furs, flax, wheat, and hemp more speedily to market.

The Lena, rising in the mountains near Lake Baikal, is the great artery of trade and communication in Eastern Siberia. It begins to be a navigable river at no great distance from its source, and between Kirensk, its point of communication with Irkutsk, and Yakutsk, at its great knee lower down, a considerable traffic is maintained. At Yakutsk it is frozen over for more than 200 days in the year (October to May).

Coming round to the Pacific slope, the first great river we meet with is the Amur, which the Tartars call Kara-muren and the Manchus Sachalinmala, both meaning "Black River," from its dark-brown colour, and the Chinese, Chelung-kiang, or "River of the Black Dragon." Formed by the confluence of the Shilka and Argun at the northern extremity of the Kiangnan range, and joined below by the Sungaria from Mantchuria, the Amur is a great river, destined to be of the utmost importance as the highway of Russian trade in Eastern Siberia. It is navigable by steamers up to Chita on the Ingoda, a tributary of the Shilka—a distance of nearly 2500 miles by river.

The two great rivers of China, the Hoang-ho or Yellow River and the Yang-tse-kiang (the "Son of the Ocean"), have their head-streams near one another in the Kuen Lun mountains of Eastern Tibet, and after widely divergent courses tend to meet again near their mouths. The Hoang-ho ("the trouble of the sons of Hona") is a wayward and turbulent river, which has changed its lower course over the level plain of China no less than nine times within the period of historical record. Its last change, accompanied by great calamities through the bursting of its embankments and the burying of entire villages in mud, took place from 1851 to 1853, when it broke through its northern banks and took a course to the Gulf of Pe-chili, in place of its old channel which reached the Yellow Sea about 600 miles north of the mouth of the Yang-tse-kiang. It is little used for navigation, Chinese vessels being unable to stem its current, and in its present condition it is unserviceable for steam traffic; but it may be said to confer agricultural prosperity upon some 70,000,000 souls who live in the provinces through which it flows.

The Yang-tse-kiang may be considered as the monarch of all the noble waters which issue from the Central Asian highlands. It emerges from the grand mountain gorges of Tibet, at a distance of about 1300 miles from its source, there making its way through narrow clefts with precipitous walls of rock, so narrow in some places that boats passing up or down keep to their own side of the stream to avoid

collision. The great stream thence permeates the most thickly-peopled provinces of China—provinces inhabited by about 120,000,000 souls. It sustains the life of this enormous population by supplying the necessary moisture, and, as the great commercial highway of China, by the means of water-traffic and of irrigation. No river has in ancient or modern times played so important a part in the increase of the human race as the Yang-tse-kiang. Its supply of water is immense and unailing—an essential characteristic caused by its connection with the snow-clad and ice-bound regions of the great central plateau already described, within which it has a course of 700 miles before entering China proper. The Tsi-tan rapid, at the mouth of the Metan gorge, about 1200 miles from its mouth, marks the limit of its navigation for larger vessels; but the Chinese traders ascend it for fully 1000 miles further, tracking or towing the boats up the perilous rapids by the united efforts of from fifty to 200 men, who earn their living partly in this way, partly by pillaging the many wrecks that occur. The vast size and importance of the lower river may be estimated when it is remembered that ocean steamers (those which bring tea to England) can easily ascend to Hankow, 700 miles from the sea, to take in cargo there.

The Song-ka, the river of Tong-king, which rises in the Chinese province of Yunnan, has recently been explored by French travellers with a view to its utilization as a highway of trade.

Still further south, approaching the slope to the Indian Ocean, we come upon the Me-Khong or Cambodia, the greatest river of Further India, which also has its sources in the mountains of Yunnan, and which thence flows south for 1700 miles through Siam and Cambodia, to form its great delta of Lower Cochín-China, now held by the French. In 1866-68 a French expedition explored a large part of this great river, which in many places is narrowed by rocks and by sandbanks to such an extent as to make it improbable that it will ever become a great highway of trade.

The Menam, or "Mother of Waters," the central river of Siam, the river of the busy port of Bangkok, like another Nile, fertilizes its banks by its annual overflow.

Coming round the Malay peninsula to the Indian Ocean, we first reach the Salween, a fine river, the mouth and lower course of which are included in British Burmah, and its neighbour river the Irawadi. Both of these have their waters also in the mountains of Yunnan. The former is navigable for 400 miles above its seaport of Maulmain, to where it breaks by rapids through a mountain gorge; the latter can be ascended without difficulty for nearly 600 miles, to a defile through which it passes above the town of Bhamo.

Next we come to the twin rivers Brahmaputra and Ganges, with their huge delta at the head of the Gulf of Bengal. For a long time it was not known which of the rivers of South-eastern Asia received the waters of the Sanpo, the great river of the Tibetan plateau, which flows eastward behind the ranges of the Himalaya, and on which vessels of considerable size pass and repass at an elevation of 13,000 feet above the sea. There is now, however, no doubt that the Sanpo is the upper course of the Brahmaputra, and that it breaks through the Himalayan chain, turning south in about 95° E., where it has the name Dibong. Reaching the lowland of Assam it reverses its earlier direction, turning west and south-west to join its waters to those of the Ganges on the east of the delta. Though rapid, the lower Brahmaputra is navigable throughout Assam to where it takes the name of the Dibong in issuing from the mountains. The Ganges (Gangā), the sacred river of the Hindus, rises in a snow-field of the southern face of the Himalaya, at an elevation of nearly 14,000 feet above the sea, rushing down as a torrent to the

highest accessible point on its banks (10,300 feet), where the temple of Gangotri is built. To the Hindu a bath or a drink of the sacred water at this point has wonderful atoning virtues, and those who cannot themselves make the pilgrimage hither are supplied with flasks of the holy element, bottled by the priest of Gangotri. At Hardwar, 1050 miles from the delta, the Ganges leaves the mountains, and entering the great plain becomes at once a navigable river. At Allahabad the Jumna, which has followed a parallel course from the mountains, adds its strength; thence by Benares and Patna, it passes eastward to weave its many mouths with those of the Brahmaputra, and to wage a battle twice daily with the inflowing tide among the malarious islands of the Sundarbans. One of the westerly delta branches (the Hoogly), on which Calcutta stands, is the most frequented highway to the sea.

The Indus, the great western river of India, has its source, like the Brahmaputra, high up in the dreary table-land of Tibet, and not far from the sacred Mansarawar lakes, which lie between the heads of these two rivers, at an elevation of 14,500 feet above the sea. Its course between the Himalaya and the Karakoram ranges is first north-west; like the Brahmaputra, it then turns south to find its way by deep gorges to the Indian plain. At Attock, where it is still 1000 feet above sea level, and 950 miles from the sea, it receives the Cabul River, of nearly equal volume; and this is the limit-point of its navigation, though it cannot be ascended during the floods from May till September. Midway from Attock to the sea it is joined on the left by the Panjnad, which brings to it the united waters of the Jehlm, Chinab, Ravi, Bias, and Sutlej, which make up the "five rivers" of north-western India that give its name to the country of the Punjab (Persian, *panj*, five; *ab*, water or river).

From its shifting channels and sandbanks, and the arid nature of the country through which it flows, the Indus is of less value as a highway of traffic than most other rivers of equal magnitude; and in winter, or the season of low water, only one of its numerous delta outlets is available for passage to the sea; yet the Indus Steam Flotilla Company keeps up regular communications between Kotri, above the delta, and Multan in the Punjab.

The great rivers which embrace Mesopotamia, the Euphrates and its twin brother the Tigris, may possibly play an important part in history again, as parts of a great highway to India; the former, from its source near Mount Ararat in Armenia, flows first westward, like the Indus, through the mountain ranges, to turn south into the lowland, after having approached to within 100 miles of the Mediterranean. It is significant that just at this point (at Bir, 1150 miles from the sea) the river becomes navigable for light draught steamers, and leads thence in a direct line to the head of the Persian Gulf.

The Tigris (the "arrow"), springing within the great bend of the Upper Euphrates, is a more rapid river, bringing down great quantities of mud; joining the Euphrates about 120 miles from the head of the gulf, it forms with it the deep tidal channel called the Shat-el-Arab, navigable for ships of 500 tons. At present these great highways stand almost idle.

If we turn now to look at the interior or continental drainage area of Asia, the space from which no rivers escape to the sea, we find that it embraces both the wide dry region of the lowlands which surrounds the Caspian and the Sea of Aral, and the interior plateaus of both great divisions of the Asiatic highlands, Tibet, Turkestan, and Mongolia in the east, and Persia and Arabia west of the isthmus of the Hindu Kush. To the lowland regions belong the great residual lakes of a former Mediterranean, the Caspian, the Aral, and Lake Balkash, with many smaller salt pools.

The Aral (the "sea of islands"), 26,900 square miles, is a wider and larger expanse than the Irish Sea, and we may compare a voyage across it in one of the Russian steamers which navigate it to one from Liverpool to Dublin. But it is much shallower, and the gigantic reeds, 20 feet high, which surround its shores are ever gaining upon its receding and brackish waters, and forming new islands. Though it lies in the same latitude as Southern France, it has ice a foot thick over it in winter. Unlike the Caspian, its level is 157 feet above that of the ocean. The rapid evaporation from its surface is compensated by its feeders, the Syr Daria (or Jaxartes) and the Amu Daria (Oxus), from the Thian Shan and the Pamir edges of the great central highland.

Both of these rivers, the largest of those in the continental drainage system of Asia, are navigated by small Russian steamers, though both have a rapid flow.

The curving Balkash Lake, 350 miles long, receiving seven streams from the Alatau Mountains, which rise south of it, the chief of these being the Ili, is a still shallower expanse, the greatest depth found in it by the Russian explorers being only 70 feet, and its waters are bitterly salt. Though in the same latitude as the Aral, it has a more continental position, and it is also much higher above sea level (600 to 700 feet), so that it is frozen over from November till April. South of it, filling a high mountain valley of the Thian Shan and Alatau ranges, at a height of about 5000 feet above the sea, lies a remarkable expanse of brackish water called the Issyk-Kul, or "Warm Lake," 120 miles long from east to west, and more than ten times larger than the Lake of Geneva. It is very deep, and perhaps mainly on that account never freezes; it has, besides, another peculiarity, that of overflowing occasionally to the Chui River, one of the many which terminate in the smaller salt lakes of the lowlands of Turkestan.

Within the continental drainage of the highland of Asia the most important river is the Tarim, which gathers its waters from the sides of the crescent of mountains that encircles Kashgar and Yarkand in high Eastern Turkestan. Many of its head streams are employed in irrigating the cultivated land round these cities, but the remainder escapes away eastward into the desert to keep up the supply of Lake Lob, a great marshy expanse at a level of about 2000 feet above the sea, which was rediscovered by a Russian explorer in 1877.

On each side of the vast central desert the mountains of Tibet and of north-western Mongolia form many isolated basins, each with its central lake fed by the mountain streams. One of the largest of these, not far from the sources of the Hoang-ho and Yang-tse-kiang, is the Kokonor, or "Blue Lake," 10,500 feet above the ocean, and about 200 miles in circumference. The Tengri-nor, called the Nam-cho or "Sky Lake," in the vicinity of Lassa, is another of these large isolated basins.

Almost the only river of importance in the western highland region of interior drainage is the Helmand, which flows south-westward from the Hindu Kush with varying volume, to fill the pools of the great expanse called the Hamun Swamp, or Seistan Lake, on the borders of Eastern Persia. At ordinary seasons the Hamun, which reaches through a length of 70 miles, is for the most part dry and grass-covered, its edges being marked only by reed beds and clay cliffs.

Lakes Urumiah and Van, in the mountain regions between Armenia and Kurdistan, west of the southern Caspian, are the largest lakes of the western division of the highland. The former, 85 miles long, has water of such intense salinity that no fish can live in it, and it lies at 4000 feet above the sea; the latter, Lake Van, 5120 feet in elevation, is of somewhat smaller dimensions, and is a slightly brackish. Saltiest of all salt lakes, perhaps,

is that known as the Tus Gol ("Salt Lake"), the centre of the interior drainage of the plateau of Asia Minor, 60 miles long; no fish can live in it, birds avoid it, for their wings, if they bathe in it, become covered with a stiff salt crust.

Bahr Lût, or the Dead Sea, the most remarkable sheet of water in the Old World, is hemmed in by cliffs 1500 and 2000 feet in height, rising almost perpendicularly from its shores. It is 1292 feet below the Mediterranean, the deepest lake-basin in the world, is 46 miles long by $9\frac{1}{2}$ broad, receives several tributaries, the Jordan being the principal, but has no outlet; is intensely salt, and contains springs of bitumen, for which reason it was named *Lacus Asphaltites*.

Climate.—Like Europe, Asia belongs for the most part to the temperate zone; only the southern promontories and islands reach into the tropical belt; only the broad northern border of the Siberian lowlands extends into the Arctic Regions.

This position of the continent in latitude, together with the effects of its great highland barrier, reaching across it from south-west to north-east, exposing all its northern slope to cold atmospheric currents from the Polar Region, and shutting it off from the warm winds of the south, brings about a broad triple division in its climates—1, that of Siberia, from the icy sea to the south of the mountains; 2, that of the Asiatic highlands; 3, that of India and the southern promontories.

Besides their contrast in temperature, these three divisions of the continent are even more strongly distinguished in their supply of moisture. During summer, or while the vast area of the continent is beneath the more direct influence of the sun approaching the northern tropic, the winds are drawn towards the heated land from all sides. Thus the peninsular region south-east of the mountain belt combines heat with an abundant rain supply, brought to it by the "monsoon," or seasonal wind from the Indian Ocean (S.W.), and from the Pacific (S.E.); so that Hindustan, Further India, Southern China, and the islands which lie beyond, are characterized by luxuriant plant life. During summer, also, the winds are drawn in from the thawing Arctic Ocean on the north, from the Atlantic on the west, and the Pacific on the east, to the northern slopes of the continent, and bring the moisture supply which supports the vast forests of Siberia. The outer edges and slopes of the central mountain region thus intercept the rainfall, which maintains the great rivers which flow from them north, east, and south to the sea; but the plateau lands between these encircling heights are screened from them by the rain-bearing winds, and are consequently dry and bare.

Thus it is that all the inner plateaus of Asia, the vast region of Mongolia, of Eastern Turkestan, and Tibet, of Persia and Asia Minor on the west, present landscapes of bare steppes and sandy deserts, with their accompanying dry atmosphere, cloudless blue skies, and failing and treacherous periodical streams that end in salt-lakes or evaporate in the sands. Hence also their inhabitants, compelled to seek fresh pastures and watering-places with almost every change of season, appear as restless nomads; and thus their inclination, so frequently illustrated in the history of the continent, to quit their barren steppes at times, and sweep like a devastating flight of locusts over the settled nations of the south and west.

One very prominent feature of the climate of Asia, which is more pronounced here than in any other part of the world, is due to the vast extent of the continent. In Europe the extremes of daily and yearly temperature grow wider and wider apart as the maritime climate of our islands is left, and we advance eastward towards the Russian steppes. In Asia the same divergence continues to increase towards the central regions of the great continent. The Russian army, advancing towards Khiva in

the campaign of 1839-40, experienced vicissitudes of temperature from a heat of over 100° Fahr. to a cold in which the thermometer sunk to 45° below the zero point, and Khiva owed its safety then to the climate of its surrounding deserts. At Yakutsk, in Eastern Siberia, the culminating point of excessive climate in all the world is reached. The temperature there sinks to the lowest known point, many degrees below the average of the Polar Ocean to northward of it, and the soil is permanently frozen, as was proved by the sinking of a shaft, to a depth of 380 feet. From October on through the winter till April, frost holds sway both day and night, the average temperature of January being 45° below zero. Two months later the Lena is free from ice; the surface soil has thawed for 3 or 4 feet, and the warmth of the short summer is such that grain will ripen in the shallow stratum of soil above the frozen mass beneath, the mean temperature of July being 69° Fahr., or as high as that of Paris. Here, then, at what may be called the pole of excessive climate, the year is divided into a long winter and a short summer, with rapid change times between. Outward from this, toward south and east, the extremes decrease, till in India, and all the maritime regions of the south-east, the seasons are marked rather as the dry and the wet, according to the direction of the monsoon wind, than by changes of temperature; and in the islands of the East Indies, about the equator, the minimum line of annual variation of temperature is reached. At Colombo, in Ceylon, for example, in contrast to Yakutsk, the average temperature of each month of the year remains very nearly the same—in January 80°, in July 81°.

Many parts of Southern Asia are unhealthy. Intermittent fevers are so common in the lower parts of India that mountain "sanitaria" have been established for Europeans, who can thus enjoy a temperate climate. The "Sundarbans" of the Ganges delta are believed to be the very home of cholera. A yellow fever imported from the West Indies has spread, especially in the Moluccas. The plague which, at different periods from the sixth till the seventeenth century, visited Western Europe, made its devastating march thither from China. Hence the strictest quarantine is maintained along the trade routes of the south of Asia.

Botany.—With reference to the character of its vegetation, Asia may be conveniently divided into seven regions—1, the Siberian; 2, the Tartarian; 3, the Cashmerian; 4, the Syrian; 5, the Himalayan; 6, the Indian; and 7, the Malayan or Equinoctial.

1. The *Siberian* region in its general features is essentially European on the W., and similar to the north-west coast of America on the E. The vegetation is of the most stunted description; cabbages will not exist, and corn is almost unknown in a growing state except in the southern parts. In somewhat milder districts the country is clothed with immense forests of birches, larches, and pines. Great numbers of gentians, with quantities of dwarf almonds, and a large variety of other pretty flowers, fill the meadows and open parts of the country. Lilies of different kinds are met with in abundance in the eastern parts of the Siberian region, and their bulbs are used in Kamtschatka for food.

2. The *Tartarian* region resembles the Siberian in most respects; and it may even be doubted whether it ought to be botanically distinguished. It may, however, be characterized as being essentially Siberian in its genera, but distinct in the majority of its species. Of the few species which botanists have seen from the most southern part of this region, scarcely any are met with in Siberia. What is called by travellers Tartaric furze consists of prickly species of *Genista*, *Astragalus*, and *Caragana*; and the gooseberries, currants, willows, and rhubarb are all of kinds unknown to the north of Asia, starved and stunted by the keen, withering climate.

The passes to the northern face of the range of stupendous mountains which divide the Himalayan region from that on the W., are described by Burnes as almost destitute of vegetation; but the assafœtida plants grow there in great luxuriance, and form the principal pasture of the flocks which browse on them. An umbelliferous plant, called prangos, is also found a good winter food for sheep.

In some places of this Trans-Himalayan region many trees are met with, among which are Tartaric species of ash, hazel, cypress, oaks, poplars, birches, pavia, &c. The Neoza pine, the seeds of which are eatable, like those of the stone pine in Europe; the Indian cedar, and a few other trees with a northern aspect, straggle on the mountains from the Indian side. Where the climate is less arid, fruit of great excellence is produced; and in Kunawir, barley, buckwheat, and turnips were seen at 13,600 feet; and a little lower the ground was covered with thyme, sage, and many other aromatic plants.

3. In the northern districts of Persia, and in that district which may be called the *Cashmerian* region, the vegetation is very similar to that of Europe. Rice, oranges, and olives, pomegranates, almonds, and fig trees, remind the traveller of Italy, while grapes, mulberries, and the ordinary European fruit trees are also plentiful. All things that require much heat and light to arrive at perfection, such as tobacco, the opium poppy, the manna ash, are produced in the Cashmerian region in the greatest excellence. The walnut, which is here wild, is cultivated extensively for the sake of the oil which is pressed from its seeds, and used in cookery, for burning, and, instead of linseed oil, for painters' work. The vine, horse chestnut, rice, and corn flourish here. The Singhara nut forms an object of general cultivation in the lakes which surround the city of Cashmere. Nothing perhaps is more remarkable in Cashmere than its floating gardens, formed from the entangled stems of water-lilies covered with earth, and planted with melons and cucumbers, which, thus treated, arrive at the highest state of perfection.

4. The *Syrian* region comprehends the greater part of Turkey in Asia, and the north of Arabia. At its western extremity it resembles the north of Africa and the south of Europe in many of its plants; on the east it is occupied by species having a certain degree of relation to the others, but more Indian in their character. Desolation is the characteristic of a very large part of this region, of which Sind may be considered the most south-eastern point. Here the vegetation of uncultivated tracts is of a miserable description. Great quantities of a sort of tamarisk, intermixed with thorny acacias, constitute the principal features of the scenery.

5. The *Himalayan* region is characterized by an intermixture of tropical and temperate plants, the former of which ascend the sides of the hills till they lose themselves among the latter, which in their turn give way, as the snow is approached, to truly alpine vegetation. As the Himalayas ascend from the plains, the pine-apple is found no longer to flourish; mangoes and custard-apples suffer from cold; the plaintain is only able to exist in consequence of the numerous coverings formed by the sheaths of its leaves. The trees are nearly the same as those of the plains of Upper India, "consisting almost entirely of dicotyledonous species, which lose their leaves in the cold weather as completely as trees in more northern climates." Two species of *phenix*, or date, form the only palms that are met with; and bamboos become few and weak. But within the Himalayas are found oranges in a wild state, arborescent plants related to the cashew-nut, cassias, and gigantic cotton trees, great forests of saul trees, and shrubby euphorbias. Cane palms reach these valleys, but ascend no higher; and are met by a pine which descends from the mountains, till it loses itself amidst tropical forms, and

a few straggling elms, willows, roses, violets, and other European-looking plants.

It is in the mid region of the Himalayas that its most lovely features are to be seen. Here in many places occur in the rainy season a few lingering tropical herbs, which are protected from the cold in winter by the earth in which they grow; the trees are oaks, sycamores, elms, hornbeams, and pine trees, and the shrubs, berries, roses, and honeysuckles, all of Indian species but European forms. Here also are found numerous saxifrages, crowfoots, geraniums, and violets, with gentians, primroses, and labiate plants, and the scarlet rhododendron.

As we ascend from the second belt, trees of rhododendron and *Quercus lanata* are first passed through. To them succeed pines and firs of various kinds; oaks in great variety, yews, birches, sycamores, and poplars, roses, viburnums, and honeysuckles; after which follow patches of snow, with the Himalayan bamboo levelled with the ground. To these succeed forests of *Quercus semicarpifolia*; and finally the limits of vegetation are marked by a few starved yews and junipers.

The agriculture of this region is as singular as the other parts of the vegetation; wheat is sometimes cut at the top of a mountain, and rice at its foot. Maize, millet, and many small grains constitute "the rain-crop;" capsicum, turmeric, and ginger are grown as high as 4000 feet; cotton succeeds even in Kumaon, and wheat is cultivated as high as 10,000 feet.

6. In the Indian region we include Arabia Felix, Burnah, Siam, Cochinchina, and the continental lands connected with these countries. What is called jungle is met with in most parts of this region. In these damp and swampy forests eternal pestilence reigns; so that the native woodcutters are often unable to remain in them more than a few days at a time. It is here, however, that are found the sapan trees, so important for their extreme hardness, teak, and many of the finest of the Indian timber trees, and numerous species of ferns, together with those singular plants called by botanists *orchideous epiphytes*, which cling by their aerial roots to the branches of trees.

In the cleared ground, where the soil is exposed to the rays of the sun and the earth is dried by a free ventilation, palms and evergreen trees of remarkable kinds are met with. Mangos, Palmyra trees, cocoa-nuts, and Gomuti palms are of frequent occurrence; a coarse grass overruns the plains, except in the cultivated spots, which are occupied by rice, sesamum, cotton, hemp, sugar-canes, yams, indigo, maize, the betel, and other peppers. The branches of trees are occupied with parasitical *loranthi*. Tobacco arrives in some places at great excellence. The flora of this country is so vast that no general description can give an idea of its richness and variety.

Among the most remarkable features in the flora of India is the banyan tree, the branches of which descend to the earth, where they fix themselves, emit roots, and become in time large trunks. When a banyan tree becomes old, and acquires a great number of such trunks, one individual will have the appearance of a grove. Many cases are cited of trees of this sort arriving at a prodigious size.

Ceylon may be referred to the Indian region, notwithstanding its insular position. It produces cinnamon forests, nutmegs, and coffee; rattan-wood and ebony trees; while the forests of the island abound generally in other kinds of timber valuable for naval and other purposes.

7. The last region of the Asiatic flora is that which may be described as the *Malayan or Equinoctial*. Spread over islands lying under the line—their centres usually occupied by mountains, and their coasts washed by the waters of a vast ocean—the features of this flora are essentially different from those of the continent of India. Many of the islands are little better than a mass of jungle, or at all events

dense and pestilential woods occupy a considerable portion of the surface. These woods are so dense that the sun never penetrates them; so entangled with climbers, coarse grasses, bamboos, and cane-palms that no human being can penetrate them without a company of pioneers; and so damp that the parasites actually struggle with the leaves of the trees on which they grow for mastery over the branches; spice trees, nutmegs, and cinnamon, cauphor trees, and tree-ferns here find their home; and in the depth of their recesses is sometimes nourished the fungus-like form of the huge *Rafflesia* flower. On the mountains are many species of oak, dammar pines, rhododendrons, and magnolias; and at the summits are found crowfoot, valerians, bilberries, berberries, brambles, honeysuckles, gentians, and other well-known European forms.

Zoology.—With extreme diversities of climate and geographical features we may be assured that the productions, both vegetable and animal, of Asia must be equally varied, and such is the case. In the Arctic Regions the reindeer feeds upon lichen; in Ceylon the elephant browses on the foliage of the ancient forest. The number of species peculiar to Asia and its dependent islands is very considerable; but these are restricted to the central and southern regions, for in the more northern latitudes the Mammalia are mostly common both to this portion of the globe and that of Europe, the geographical division being arbitrary. Along the shores of the icy Sea, from Lapland to the country of the Tchuktschi, the reindeer, the white bear, the polar fox, the ermine, the wolf, and others, are characteristic of the latitude.

South of the Arctic Circle, in the vast deserts of Siberia, the bear, wolf, ghutton, sable, ermine, zibeline, and others, with the fox, chased by the hunters for their valued fur, abound in vast multitudes. The colts antelope is found on the elevated steppes, along the Altai chain, and an allied species is numerous on the arid plains. The elevated steppes of Siberia, the Altai Mountains, those of Persia, the Himalayan chain, the mountains of Nepal, Bhutan, and Tibet, and those of Kamtschatka, are tenanted by various species of wild goats (*Ovis*), and various species of wild sheep, as moufflons and argalis; several climbing antelopes, as the chiru, the thar, the jharal, and others, are found more particularly in Nepal and the Himalayas.

The wild horse still exists in the remote deserts of Mongolia; and the dziggatal, the wild ass, and other equine animals wander at will in Central Asia, Persia, Cabul, Beloochistan, Sind, Cutch, and among the Ghats, and the hills of Katmandoo and Lower Tibet. The yak is found wild in Tibet, where it is kept also in a domesticated state; it is also found in the high mountains of Nepal. In all this region several large carnivorous animals of the feline tribe exist. The lion is found in Persia and Arabia, and along the banks of the Euphrates; it thence extends through Beloochistan, Sind, and Cutch to Guzerat. In Guzerat the lion is maneless.

Passing from the Himalayan and Nepal ranges into Hindustan the ape tribes make their appearance. The orang-outan is found almost wholly in Borneo and Sumatra. In many parts of India monkeys are exceedingly numerous, and being protected become bold and mischievous. Besides the lion, panthers, leopards, cheetahs, and other feline animals abound, and among them the tiger. This fierce animal frequents deep jungles, and makes terrible destruction in some districts. The tiger is found in Tonquin, Siam, the Malay peninsula, and the adjacent islands, as Sumatra, &c. The striped hyena is common in India, and exists in Persia, Syria, &c.

Of bears there are several species, of which the sloth bear is the most formidable. The common brown bear is found in Siberia, and in the mountains of Sylhet and Nepal resides another species of a pale buff yellow. In

the highlands of Palestine the Syrian bear exists. The Malayan bear is found in Sumatra; it is the baring of the Malays; and Borneo possesses also a distinct species. We have already said that the Polar bear lives within the Arctic Circle. Foxes of various species and wolves are common. Several distinct species of true wild dogs are found in India, in the Himalayan and Nepal Mountains, and in the Indian Islands, as well as in other parts of Asia. Smaller ferocious animals are numerous.

Of wild cattle there are several species, as the wild buffalo or arni, the gaur, and the jungly-gau. The domestic cattle of India are of the humped or Brahmin breed. The camel is used in a domestic state in India; but the two-humped or Bactrian camel is spread through central Asia, Tibet, and China.

India and the island of Ceylon possess the elephant, which is employed, as it was in the most ancient times, as a beast of labour. This species is distinct from the African. The finest elephants are those of Ceylon, but the ordinary ones usually employed are obtained from the great saul forest which skirts the lower ridges of the Himalayan chain. This animal is found in the Malay peninsula, Cochín-China, Siam, and Pegu. In the same regions (Ceylon excepted) the Indian rhinoceros exists; but there is a distinct species in Java, and another in Sumatra. A species of tapir inhabits the Malay peninsula and Sumatra. The wild hog is common in India and other parts of Asia. The baboon inhabits Java and the Molucca Islands.

Deer and antelopes are numerous in India and the islands, and are spread over other parts of Asia, both to the east and west. The musk deer inhabits Tibet. Small animals of the rodent order, as squirrels, rats and mice, jerboas, &c., are very numerous. Bats abound, and fruit-eating bats of huge size inhabit Java and the Moluccas. Various breeds of domestic sheep are kept in India and throughout Asia generally, but the long-tailed and the fat-rumped races chiefly prevail. The goat of Cashmere is noted for the fineness of its wool.

With respect to birds Asia is very rich. All our domestic poultry, except the turkey, originally came from that continent, where they run wild in the woods with the peacock and pheasant. We derive the latter from the banks of the Phasis; the fowl from the jungle fowls of India and the islands; there also the peafowl is found in a state of nature. The gold and the silver pheasant, Reeve's pheasant, and others of extraordinary beauty are indigenous in China. Birds of prey, insectivorous birds, and those of the aquatic races, as well as of the gallinaceous order, are abundant. The cassowary is found in Java, Sumatra, Banda, and the Moluccas. The ostrich, king of birds, inhabits the south-western districts; the nightingale sings in Persia; but birds of song are generally scarce, while those of splendid plumage abound in the south-eastern districts. Bustards are common in the plains of India. Numbers of the birds of Asia are identical with those of Europe. India and the islands present us with huge pythons, and snakes more deadly, though of a smaller size, such as the cobra; besides beautiful tree snakes. Sea snakes are found swimming in the Indian seas. That terrible species of crocodile called the gaviel inhabits the waters and banks of the Ganges.

The seas and rivers and lakes teem with fish, many of them remarkable for their habits, as the tree-climbers [see ANANAS], others for their marvellous forms and beauty. The fishes of Ceylon are celebrated for the splendour of their colours.

If we have said nothing of the insects, crustacea, and molluscs of Asia it is because it would be impossible, within reasonable limits, to give even an outline of the subject; and this is the less needful, as they are more or less assimilated to those of other continents, showing themselves in their most curious forms and striking colours in

the warmer latitudes. The corals of the Indian seas are varied beyond enumeration; and the waters are replete with Acæphææ, and with countless strange creatures which are the peculiar tenants of the deep.

Minerals.—The mineralogy of Asia is rich and varied. Mines were opened within its limits in far remote ages. The mountains of Kurdistan, on the eastern border of the old Assyrian empire, have ancient workings from which supplies of copper, iron, and lead were drawn. Sir A. H. Layard, during his interesting explorations in the region, visited a disused copper-mine, only known to a few mountaineers, nearly blocked up with earth and rubbish. He found the metal occurring in veins, small crystals, compact masses, and powder, and recognized at once in the latter the material used to colour the bricks and ornaments in the exhumed palaces of Nineveh. Inscriptions on copper, various utensils, figures of lions in the solid metal found in the long-buried halls, bear witness to its extensive use, while it is the ordinary material of tools, daggers, arrow-heads, and armour. Gold, copper, and iron are now obtained from mines in connection with the Ural Mountains; gold, silver, iron, lead, and the finest porphyries from the Altai chain. Tin has been supplied for centuries by Banca Island, in the Indian Archipelago; quicksilver occurs in Tibet, China, and Japan; kaolin or the finest porcelain clay and zinc are abundant in China; coal is found in Asia Minor, India, China, and Japan; salt is extensively distributed the best lapis lazuli, used for ornamental purposes, from which also ultramarine is made, is procured in Bokhara; and Asia has furnished a greater number of precious stones of the more costly kind than any other part of the world. The largest topazes come from Siberia, the finest sapphires from Ceylon, the best rubies from Burmah; and the most valuable diamonds in European crown jewels are of Asiatic origin. The great Russian diamond, placed at the top of the imperial sceptre, formerly adorned the throne of Nadir Shah, and passed from Persia to St. Petersburg for 450,000 roubles, about £70,000. The Regent diamond, the property of France, at first set in the crown, and then affixed to the sword of state, was purchased in India by a governor of Madras, and resold to the Regent, Duke of Orleans, for about £80,000. But these are exceeded in size and value by the Koh-i-nûr ("mountain of light"), the property of the English crown, originally found in the year 1550 on the banks of the Godavery, in the Deccan. This was long the pride of the Mogul emperors, from whom it passed to Runjeet Sing, ruler of the Punjab, and became British upon the annexation of that territory to the Anglo-Indian empire.

People.—Both legendary and scientific history have placed the primal seat of the human race in Asia, and concur in pointing out this region as the quarter whence population has gradually extended over the rest of the earth. While most of the nations inhabiting the continents of Europe, Africa, and America have been traced to a foreign origin, the population of Asia has on all hands been allowed to be wholly indigenous, if we except the Tehuktes, a small tribe in the north-east, the Russian colonies in the north, and the well-known European settlements in the south. The whole foreign element, however, is but an insignificant fraction compared to the number of the human race in this quarter of the world. This number, though immense, is below what might be expected in regions so early peopled, and abounding in every production which can contribute to the subsistence or the comfort of mankind. But the feeble and despotic governments of Asia have been most unfavourable to the increase of its population; and the amount to which it has attained, in spite of this powerful check, is one of the best proofs of the kindness of nature, and the luxuriance of the soil throughout much of this continent.

The population of Asia is reliably estimated at about 800,000,000, or nearly two-thirds of the inhabitants of the globe. But these teeming multitudes are far from being evenly distributed over its surface. From the inhospitality of the climate through the entire north, and the large area occupied by towering mountains, chill plateaus, and dry sandy deserts, the people are very irregularly distributed, being thinly sprinkled over Siberia, High Asia, Turkestan, Persia, and Arabia, while densely massed on the rich alluvial plains of China and Bengal. In Lower Bengal the average of population for the whole area is 484 per square mile. But as many parts of this great province are covered with dense jungle, tenanted only by wild animals, while others are either barren wastes or uninhabitable swampy tracts, such as the Sunderbans, the density of the cultivated districts is much higher than might be supposed even from the astonishing figures mentioned. The same remarks apply almost as fully to the valleys of the Yangtse-kiang and Hoang-ho. Such dense multitudes could not possibly be supported, even in these exuberant lands, except on the most frugal diet; and as a matter of fact rice, the cheapest of all grains, forms the staple, in many cases almost the exclusive, article of food of hundreds of millions of the Asiatic population.

Discriminated by differences of physical conformation, the Asiatics generally are divisible into two great groups of nations. A line drawn from the delta of the Brahmaputra along the Himalaya Mountains, and thence passed westward by the Hindu Kush to the Caspian Sea and the Caucasus, will generally define their respective geographical positions. South and west of the line are nations belonging to the variety of mankind commonly, but improperly, called the Caucasian, consisting of the Hindus, Afghans, Persians, Syrians, Jews, and Arabs. On the north and east are populations corresponding to the Mongolian type, embracing the Chinese, Indo-Chinese, Japanese, Mongols proper, Kirghis, and other branches of the Turkish family, with the semi-barbarous native tribes scattered through Siberia. The Malays, in the extreme southern peninsula, and also in the Indian Archipelago, are mainly a Mongolian subdivision.

Unlike the fertile peninsulas of Europe on the west, and the promontories of the south and east of Asia, all the central mass of the continent, from Arabia over the Caspian region northward into Siberia and eastward to Mongolia, is a region characterized by pastoral steppe and bare desert. Hence the nomadic character of so large a share of the population of these regions. The Bedouin of the Arabian and Syrian deserts wanders from pasture to pasture, carrying with him his black tent of woven goat's hair; the restless Kirghiz roams about the vast monotonous steppes that stretch north and east of the Caspian, as do the Mongols with their camel drives over the steppes north and south of the Gobi desert. In all this region the seats of settled and more cultivated men appear only like islets in a wild sea. In Siberia also, the settlements of Russian colonists, partly deported, partly voluntary exiles, begun in the sixteenth century, are only so many points in the midst of the native tribes, most of whom are nomadic fur trappers in the forests, or fishers, or owners of reindeer herds, which migrate north and south according to the season.

The south and east of the continent presents a remarkable contrast. There China and Japan, India and Indo-China, present densely peopled and highly cultivated lands, studded with great towns and venerable monuments of a civilization which dates from the most remote times, but which, in contrast to the progressive advancement of

invasion, and the people were then skilled in the same arts they now possess; but all impulse to higher culture and progress beyond that point has come from without, and since the country began to pass under British rule. The Chinese preceded Europeans in many inventions—in printing and papermaking, in the discovery of the compass, in burning coal for fuel, in making porcelain, guns, and gunpowder; but with these the inventive power seems to have become exhausted, and though foreigners have come and gone, teaching new arts and sciences, the Chinese hold tenaciously to the same beaten paths of ancient custom. The Japanese alone have fully awakened, and this only in very recent years, and after several centuries of rigid seclusion from the outer world, to the knowledge of the superiority of western civilization. As the result of this sweeping reforms have been made, and the whole spirit of that nation has been rapidly transformed.

With the nomadic tribes of Central Asia patriarchal government is associated. In the anciently civilized states of the south and east the ruler is always an absolute monarch or despot. No other form of government than this—except for village or tribal rule—has ever been known on the continent. The ancient Babylonian, Assyrian, and Persian empires, like those of the Arabs, Mongols, and Turks, following them, were all despotisms—the rulers having frequently, as at the present day in China, Japan, and Tibet, the double attributes of religious and political supremacy.

Religion.—Among the various forms of religion in Asia two systems, inveterately hostile, prevail in the south and south-east, where population is the densest, and are remarkable as governing the thoughts and actions of nearly half the human race—Buddhism, with perhaps not less than 400,000,000 professors; and Brahmanism, with 150,000,000. The former holds sway in Ceylon (where it is found in its purest and simplest form), Burmah, Siam, Tibet, Nepal, the Japanese empire, and over the Mongols generally. The latter is the national creed of India. Yet there is reason to believe that Buddhism was once extensively prevalent for a long period even in India, till uprooted by persecution from the priesthood of the other creed. Among the monuments of past time in that country, cavern temples occur belonging to both religions, which curiously illustrate their difference, and prove their former contiguity. The deities of Brahmanism are supposed to have often become incarnate, under a variety of forms, sometimes appearing with many heads and hands, or with the heads of animals, and other unnatural combinations, of which there are sculptured representations in the cave-temple of Elephanta, near Bombay. Buddhism, on the contrary, seems to deny the very existence of a personal God, and shuns the prospect of immortality. The four "Sublime Verities," as they are called, which are represented as constituting the sum and substance of Buddha's teaching are these:—(1) Existence is only pain or sorrow; (2) the cause of pain or sorrow is desire; (3) in Nirvana all pain and sorrow cease; (4) the way to attain Nirvana (annihilation) is by the "noble path," which means virtuous self-discipline ending in ecstatic oblivion of self-consciousness. When this last point is reached everything that constitutes our separate individuality—feeling, thought, the very consciousness of personal existence—is annihilated, the oil that fed the lamp of life is drained off, and the flame goes out of itself. It is true that the man who has reached this blank mental nothingness still exists, but all that is left of his personality is the mere bodily form. When death has dissolved that, there is nothing left to constitute the basis of a new existence of trouble and sorrow, nothing to light up the lamp of life anew; and Nirvana, already virtually attained, reaches its actual consummation in death. In temples of the Buddhist faith there are no

which, in contrast to the progressive advancement of
1. The Chinese point be and which it
cannot advance of its own inward vitality, one generation
of men following another in the same stereotyped progress.
11. The role of India rode on elephants and lived in
splendid palaces at the time of Alexander the Great's

many-headed and many-handed monsters sculptured, no combinations of man and beast, but simply the images of men in various attitudes, sometimes standing upright, but usually sitting cross-legged in a meditative posture. At no great distance from Bombay, the caves of Kanara in the island of Salsette, and those of Karli on the mainland, belong to Buddhism; those of Amboli, also in Salsette, and of Elephanta adjoining, belong to Brahmanism; while examples of both kinds occur at Ellora, in Hyderabad.

The creed of Islam ranks next in the number of its adherents within Asian limits, reckoned at 70,000,000, consisting of all the Arabs, the Turkish tribes, the Persians, the Afghans, and a considerable number of the Hindus, upon whom it was enforced by the sword of invaders. Christianity and Judaism divide a comparative remnant between them. Forms of heathenism linger among the rude natives of Siberia; and Guebres, or Parsees, descendants of the followers of Zoroaster, remain in India and Persia, addicted to sun-worship—

“Those slaves of fire, who, morn and even,
Hail their Creator's dwelling-place
Among the living lights of heaven.”

Communities exist in the basin of the Euphrates and Tigris whose usages have a mixed pagan, Jewish, Mohammedan, and Christian complexion.

Communications.—Except in India, where 10,000 miles of railway are open to traffic, there are as yet no railways worth mentioning in Asia; but the Russians are constructing a line from the east shore of the Caspian towards Central Asia, and short lines have been laid down in Japan. China offers a vast field for railways, but the government at present sets its face against this mode of communication. India also can show several highways, each many hundred miles in length, which may bear comparison with the roads in Europe. Elsewhere in Asia there are no roads fit to be called such in the European sense of the term. Irrespective of highways, properly so termed, there are very few tracks easily passable in Asia; except in Siberia there is not one such track traversing the continent from end to end. There is no through road from the British to the Russian dominions in Asia; no road from India to China, or to Tibet, or to Central Asia. The great central plateau already described interposes extraordinary obstacles in the way of such communication, and the only instance of anything approaching to it is in the south. A horseman might, without meeting any difficulty as regards ground, ride from any part of India through Southern Afghanistan to Persia, and thence to the shores of the Euxine. Both China and India have magnificent rivers navigated by small craft. China also has navigable canals of great length. In Mesopotamia the two principal rivers, Tigris and Euphrates, are the natural highways. But extensive regions in Asia are destitute of water traffic.

Connected with communications is the subject of the electric telegraph. British India is the only Asiatic country which has telegraphic communication between all the principal towns. But some other countries in Asia have one or two through lines. From Constantinople there runs a line across Asia Minor, then down Mesopotamia to the head of the Persian Gulf. From Tiflis, in Russian territory, there is a line to Teheran, then southwards across Persia to the head of the Gulf. Both these lines are joined to the Indian system by a line along the shore of the Persian Gulf and of Beloochistan. A long line passes from European Russia, near the Ural Mountains, across Siberia to the Pacific Ocean, near the mouth of the Amur. These are all land lines, but there are submarine lines also. One such runs from Egypt down the Red Sea to Aden, and thence across the Arabian Sea to India. Another passes from Madras across the Gulf of Bengal to the Straits of Malacca, and thence

turning northwards passes near the Chinese coast to join the Japanese and Russian systems. The introduction of telegraphs is entirely due to the British and Russian governments, and in some degree to the French government. Japan is the only Asiatic country that has adopted the electric telegraph on its own account.

Political Divisions.—While Europe may geographically be described as a dependency of Asia, yet politically Asia may almost be regarded as a dependency of Europe. Notwithstanding its vast extent and enormous population, this continent has comparatively few independent states, and of these not one can be said to be entirely independent of European influences. Two great progressive European powers—Russia and Britain—now hold sway over more than half of the vast extent of Asia, and most of the great political movements that have taken place on that continent during this and the past century have had their origin in the steady and almost continuous enlargement of the authority of these powers. In India the British have been consolidating their empire and enlarging their influence south-eastward towards Burmah and Inner China, and north-westward to Afghanistan. The Russians in turn have been spreading southward over the Caucasus and over the vast thinly peopled steppes, incorporating the khanates of the Oxus and Jaxartes region, and spreading round the eastern side of the Caspian to the borders of Persia. A belt of 100 or 200 miles in width still separates the nearest points of approach of British and Russian power in Asia, but in course of time the dominions of these two states in Asia will doubtless become continuous.

Another European power, Turkey, has considerable possessions in Asia, which include a population of nearly 15,000,000. See *ASIA MINOR*.

The one great independent native empire of Asia is China, which comprehends more than one-fourth the surface of the entire continent, and more than half its whole population. China occupies the first place among the political bodies of Asia, and in this position it has maintained itself for 2000 years. The head of the Chinese empire is at a short distance from the Pacific Ocean, on the eastern side of the table-lands of the Gobi and of Tibet, in the rich and fertile and densely populated lowlands of China, or in that part which is properly called China (Chin). But all the other provinces on the south of China proper, to the north of the Great Wall and to the west of its western extremity, must be considered as parts of the empire.

The three great powers, China, England, and Russia, thus divide between them three-fourths the area and four-fifths the population of Asia. The remaining countries are Kingdoms of the second or third rank, and to a great extent either subordinate to or dependent upon one or other of the three principal powers. The Japanese, a singularly progressive people, must be excepted from this category; but Japan is isolated, has no territory at all on the main continent, and can scarcely be regarded as a great power in the political divisions of Asia.

The French settlements in Asia are confined to India and the colony of Lower Cochinchina. They comprise Pondicherry and Carical, on the coast of Coromandel, and a few other places, among which Chandernagor in Bengal, and Mahé on the coast of Malabar, are the most important. The port of Saigon and its surrounding territory, in Cochinchina, were taken in 1860. The total of the French possessions in Asia is now about 22,000 square miles, and the population 2,200,000.

The Dutch possess the rich island of Java and other settlements.

The following table, compiled from “Die Bevölkerung der Erde” by Drs. Behm and Wagner, gives the population of the various countries in Asia in 1882, according to the most trustworthy statistics then obtainable:—

	Area in Square Miles.	Population.	Area in Square Miles.	Population.
Chinese Asia:—				
China proper,	1,554,000	350,000,000		
Mantchuria,	366,800	12,000,000		
Corea,	96,750	8,500,000		
Mongolia,	1,304,000	2,000,000		
Tibet,	652,000	6,000,000		
Chinese Turkestan,	432,000	580,000		
Zungaria,	134,200	600,000		
			4,539,750	379,680,000
British Asia:—				
India—Under direct British administration, . . .	908,971	198,400,000		
“ Tributary and Protected States,	667,074	51,200,000		
	1,576,045	252,600,000		
Aden,	—	35,000		
Ceylon,	24,702	2,600,000		
Hong-Kong,	32	140,000		
Labuan,	30	5,000		
Mauritius,	701	860,000		
Straits Settlements,	1,440	350,000		
			1,602,953	256,090,000
Russian Asia:—				
Siberia,	4,824,560	3,912,000		
Caucasus,	169,550	5,550,000		
Central Asia,	1,305,300	5,036,000		
Caspian Sea,	169,660	—		
Sea of Aral,	25,870	—		
			6,494,940	14,498,000
Turkish Asia:—				
Asia Minor, Syria, Armenia, Kurdistan, Mesopotamia (valley of the Euphrates and Tigris), and the Arabian province of Hejaz,	—	—	704,650	16,000,000
Japan,	—	—	146,610	36,000,000
French Possessions in India,	—	—	196	270,000
Portuguese do.,	—	—	1,437	445,000
Persia,	—	—	618,000	4,400,000
Arabia, less the Hejaz Province,	—	—	1,100,000	8,000,000
Afghanistan,	—	—	278,600	5,000,000
Beloochistan,	—	—	106,800	500,000
Burma Empire,	—	—	190,500	4,000,000
Siam,	—	—	309,000	11,800,000
Anam or Cochín-China,	—	—	198,050	21,000,000
French Cochín-China,	—	—	21,700	1,600,000
Cambodia,	—	—	32,400	890,000
Independent Malacca States,	—	—	81,500	210,000
Sunda Islands (Sumatra, Java, Borneo, &c.), and Moluccas,	—	—	672,500	27,000,000
Philippines and Sulu Islands,	—	—	114,000	7,500,000
TOTAL OF ASIA,	—	—	17,191,586	794,883,000

ASIA MINOR, a peninsular portion of Asia, so called to distinguish it from continental Asia. It was afterwards called, during the reign of the Byzantine emperors, Anatoli, signifying “the rising sun.” Anatoli, strictly speaking, is the Turkish denomination of one of the provinces of Asia Minor, but the term has often been used to indicate the whole peninsula. It is impossible to define its limits very exactly, because both in a political and geographical sense they have varied at different times. It will suffice for the present object to define Asia Minor as the peninsula which terminates Asia on the west, being bounded on the N. by the Black Sea, on the S. by the Mediterranean, on the W. by the Greek Archipelago, and on the E. by Armenia and the Euphrates.

Mountain Chains and Central Plateau.—There are two

ranges of mountains which run pretty nearly from east to west through Anatolia, at no great distance from the respective shores. These give a peculiar character to the country; for the district between them is an elevated table-land or plateau, more or less studded with mountains; while the margins of the country, exterior to these mountains, are intersected by the comparatively short rivers which water the peninsula. The southern range of mountains, which is the most important, runs from E. to W. parallel to the Mediterranean, and obtains the collective name of the Taurus. These mountains, as well as the country generally, were imperfectly known until the present century; but the researches of Ainsworth, Hamilton, Fellows, Keane, McCoan, and others, have now thrown great light on the physical conformation of Asia Minor.

At about 38° E. lon. the Euphrates makes a semicircular bend, with a concavity towards the west; and in the hollow of this bend is a mountain mass, which may be deemed the eastern commencement of the Taurus. The highest point of this mass is the Akjah-Dagh, which is about 11,000 feet. Several small rivers intersect the mass, and near one of these is the Pass of Erkenek, the only one by which an army could descend from the interior of Asia Minor towards Syria or Mesopotamia. Various minor chains branch off from this mass, and extend to Iskenderun (Scanderoon), Syria, and other parts; and these also contain several passes which were celebrated in ancient times.

From the mountain mass near the Euphrates the Taurus range extends in an irregular line, but with a general westerly direction. At about 35° E. lon. it obtains the name of Bulghar-Dagh; it includes a narrow strip of fertile country between it and the sea, watered by the Jihun and the Sihun, and producing fruit, wine, and corn. Further west the Taurus bears the name of Ichili-Dagh, and presents two lofty isolated peaks, Kara-Dagh and Allah-Dagh. From thence the range continues to the western extremity of the peninsula. The whole tract which lies between this Taurus range and the Mediterranean has an alpine character, though the mountains are not so high as the Alps.

Northward of the mountain mass near the Euphrates are the snowy peaks of Anti-Taurus (now better known as the Azma-Dagh), which form the eastern limit of Asia Minor. Many lofty and rugged mountains mark this region, some black and basaltic, and some granitic. Proceeding west is the chain of Kara-Bel, the *Pargades* of the ancients. This range extends as far west as 35° E. lon., and terminates with the Arjish-Dagh, the loftiest mountain of the peninsula. Mr. Hamilton, when he visited this mountain, first passed over hills of black basalt; then reached a conical hill consisting of sand and ashes, with a crater partly broken; and then a rocky tract covered with juniper, where the real ascent begins. South of the highest peak stands the Kattun, an isolated rock of felspathic trachyte, like a gigantic fortress. Two hours' walk further up the ground spreads out into an amphitheatre, surrounded by steep and lofty ridges of hills, where the party passed the night. On proceeding further on the following day they found snow in all the crevices, and were obliged to clamber over dangerous glaciers. They succeeded, however, in reaching the highest attainable point of the mountain, though not the actual summit, which is a mass of rock with steep perpendicular sides, rising to a height of 20 or 25 feet above the ridge on which they stood. To the north and north-east extensive glaciers stretched down in one unbroken slope into a sea of clouds, proving all ascent on that side to be totally impracticable. From barometrical observations, combined with the result of two angles of elevation taken from different spots below the mountain, Hamilton concluded that the height of Arjish-Dagh is about 13,000 feet.

Near the spot just described a number of mountain chains branch out in various directions. There is a ridge which connects the Taurus with the Anti-Taurus, and many minor chains shoot out from this towards the west. One extends from Arjish-Dagh to the vicinity of Angora; and the others bend round in various points, so as to join and form numerous basins, filled by lakes, which form one of the features of Asia Minor.

The Anti-Taurus and its offshoots do not form the northernmost range of Asia Minor; there is yet another, which has been called the Euxine or the Lazian range; or rather the Lazian group forms the eastern extremity of the northern mountains; so that the Lazian, the Anti-Taurus, and the Taurus may be considered together to mark the eastern boundary of Asia Minor. From the Lazian group spring numerous chains, which extend west-

ward and include between them elevated terraces increasing more and more in height as they recede from the Black Sea. Indeed, the whole of the region between the central plateau and the Black Sea is studded with rugged mountain masses and chains, all of which have separate Turkish names.

Both the Taurus and Anti-Taurus are crossed at various points by passes generally at low elevations and of moderately easy access. Of these the most important strategically and commercially is the Golek-Boghaz, or "Cilician Gates," a deep gorge, 3300 feet above sea-level, running about 30 miles north of Tarsus over the Taurus, and connecting Anatolia with North Syria and the Euphrates valley. This famous defile has been followed in all ages by migrating peoples, traders, and conquering hosts. Through it Alexander marched to the overthrow of the Persian empire, and through it Mehmet Ali in the present century twice penetrated into Anatolia on his march towards Constantinople. About 100 miles west of this point the Taurus is crossed by a second pass leading from Karaman southwards to the Gok-su valley, and by a third, 150 miles still further west, connecting Isbarta southwards with Adalia. The chief openings giving access from the Euxine through the Anti-Taurus to the central plateau are those leading from Ineboli to Kastanuni and Angora, from Sinope to Amasia, from Samsun to the same place, and from Trebizond over the Kolat-Dagh to Erzeroum.

The western part of Asia Minor also has its mountains. The Morad-Dagh is a sort of central knot, from which branches extend to Mount Ida, Mount Olympus, and other elevations of historical celebrity.

The centre of Asia Minor is a very elevated plateau (3000 to 4000 feet) supported by the ranges of mountains which we have described. Part of it is drained by the rivers that flow into the Black Sea; but an extensive tract, bounded by the great barrier of Taurus to the south, is covered with salt marshes, lakes, and rivers, possessing no visible outlet. This plateau is about 250 miles long from N.E. to S.W., and 150 miles broad. The chain of lakes extends from the neighbourhood of Synnada (38° 50' N. lat., 31° E. lon.) to the Tyanitis, which lies at the foot of the Cilician Taurus, at the point where it turns to the north. In rainy seasons these lakes overflow, and would entirely submerge 200 miles of land were it not for the ridges that traverse the plains and separate them into basins. Under a proper system of agriculture these inundations would insure most abundant harvests; but they now run nearly to waste in watering pastures.

Sea-coasts, Rivers, and Lakes.—The southern coast of Asia Minor presents an irregular outline, formed by two large semicircular bends presenting their convex side to the sea, and by two other bold curves with their convex side running into the land. The coast has a very bold front to the sea throughout its extent from east to west. The western coast presents as jagged and irregular an outline as almost any coast in the world; deep bays and bold projecting peninsulas characterize it throughout. The channel of the Dardanelles (the ancient *Hellepontus*) separates Europe from Asia by a strait about 40 miles long, and at its narrowest part not more than a mile broad. The wider opening of the Propontis or Sea of Marmora, about 110 miles long (taking the longest line) and 45 broad in the widest part, is succeeded by the narrow channel known as the Bosphorus, or Straits of Constantinople (14 miles long), which unites the Sea of Marmora and the Black Sea. The coast of the Black Sea presents no very deep indentations or bays; and though the mountains are never very far removed from the shore, a considerable extent of coast from the entrance of the Black Sea along the shore of Bithynia is comparatively low; but as we advance eastward we find the highlands near

the shore, and the depth of water, as marked on the charts, very great.

In noticing the rivers of Asia Minor, beginning at Scanderoon, we meet with the Jihun (ancient *Pyramus*), which rises in about $37\frac{1}{2}^{\circ}$ N. lat. and 37° E. lon. It flows through a hilly country for about 100 miles, and is navigable in the lower part of its course. The Sihun (ancient *Sarus*) has its source in the central table-land, and flows about 90 miles into the Gulf of Iskenderun. The Tersus (ancient *Cydnu*), a small river, descends nearly 4000 feet in 40 miles. The Gok-su, the Ak-su, and the Dudon (ancient *Calycadnus*, *Cestrus*, and *Cata-ractes*) are three other rivers further to the west. The Xanthus, a considerable stream, flows through the fine fertile plain of Lycia. Westward of the Xanthus, one of the chief rivers is the Dollomon (ancient *Calbis*), which cuts its way through a ravine in a plateau 5000 feet high, and then flows about 100 miles towards the sea. No river of importance occurs from thence to the Mendere (ancient *Mæander*). This stream, so often alluded to by the ancient writers, rises about 38° N. lat., $80\frac{1}{2}^{\circ}$ E. lon., and flows about 170 miles into the Archipelago. Further north is the Kodus (ancient *Hermus*), which is about as long as the Mendere, receives like it a great number of minor streams, and falls into the Bay of Smyrna. We then come to the Bakir, the Bokla, and Edrenos (ancient *Caicus*, *Æopus*, and *Rhyndacus*).

Advancing eastward to the shore of the Black Sea we meet with the Sakarie (ancient *Sangarius*), the second river in importance in Asia Minor. It comes from two sources in the interior table-land, and after passing Angora, follows an irregular line till its termination in the Black Sea, after a course of about 220 miles. Passing over several minor streams we arrive at the Kizil-Irmak or "Red River" (ancient *Halys*), the largest river in Asia Minor. It takes its rise about 40° N. lat., 38° E. lon., and flows for about 150 miles through a picturesque valley along the northern border of the great central table-land, and afterwards follows a tortuous course till it empties itself into the Black Sea. The total length is about 430 miles. A few other rivers lie east of the Kizil-Irmak, but they are of no great importance.

Several of these rivers, with some of their affluents, and other very minor streams, are celebrated in history under their old classical names. The Halys was the boundary between the Lydian monarchy under Cræsus and the Median under Cyax, on the banks of which the first battle was fought in the struggle between the potentates, which eventually transferred the sceptre of Asiatic dominion from the former to the latter. The defeated king had interpreted an oracle in his own favour, which stated, "By crossing the Halys, Cræsus will destroy a mighty power"—an ambiguous response as much susceptible of an adverse as of an auspicious signification. From the Pactolus, a gold-bearing rivulet, which descended from the adjoining heights to his capital, Sardis, he is said to have derived much of the wealth now proverbially associated with his name. The rivulet still flows to join the Hermus, but its auriferous sands have vanished, along with the city on its banks. The Granicus, a stream of no natural importance, which Mount Ida contributes to the Sea of Marmora, witnessed the first triumph of Alexander over the army of Darius. Bathing in the Cydnu, while oppressed with heat and overcome with fatigue, the conqueror contracted a fever, which for a time threatened to prove fatal. On the plains through which it flows the heat of summer is fiercely felt, while the cold and snow of winter still mark its sources on the Tauric highlands. Hence, till the warm season is sufficiently advanced, it descends with a temperature in striking contrast with that of the atmosphere at the lower level. The Cydnu actually occasioned the death

of the Emperor Frederick Barbarossa during the Crusades, but no property belongs to it except what is common to rivers which descend quickly from cold elevated uplands into burning plains. Modern travellers have sustained no inconvenience from repeating the experiment. "We found the water," remarks Captain Beaufort, "undoubtedly cold, but no more so than that of other rivers which carry down the melted snow of Mount Taurus; and we bathed in it without feeling any pernicious effects."

Salt-lakes and beautiful fresh-water expanses are numerous distributed over the surface of Asia Minor. The largest salt-lake is the Tuz-Gol, 45 miles long by 18 broad. A ruined causeway, built by Sultan Selim, which connects the opposite banks, is covered with a thick coat of salt lying over a coat of soft mud. When the waters are high it is submerged; when low it is quite dry. The banks are flat, the environs barren and covered with saline plants. Along its eastern side extensive salt marshes stretch from N.W. to S.E., and its southern and south-western shores are surrounded by impenetrable marshes partly covered with saline incrustations. The lake yields much salt, which is easily obtained, although the state of saturation of the water, which is very high in the dry season, is diminished in the wet season, owing to several little rivers and streams emptying themselves into the lake. The other salt-water lakes of this basin are of minor importance. Among the fresh-water lakes is the Bei-Sheher, 20 miles long and from 4 to 7 wide. It is abundantly supplied with fish, and is surrounded by steep and wooded hills, intersected by picturesque valleys and well-cultivated plains.

Numerous other lakes are met with in different parts of the peninsula. Among these is Lake Abullionte, between Mount Olympus and the Gulf of Mudanieh, 20 miles long by 12 broad; Lake Manyas, on the eastern borders of Mysia, 14 miles long by 8 broad; Lake Buldur, 17 miles long by 4 broad; and Lake Chardak, 20 miles long by 4 broad. In the last-mentioned lake, in the dry season, the water is thoroughly saturated with salt, which crystallizes on the surface, and is scraped off with large wooden spades.

Hot springs occur in all the provinces. Those of Brusa are celebrated, and are even visited by European patients. The hot springs near Ereğli, in the south-eastern part of the central table-land, require a short notice. They issue out of narrow crevices on the summit of a ridge of low hills near that town, and form a succession of small pools and conical hills, which have been created by the gradual deposit of the earthy matter with which the water is charged, and which forms at first small pools round each orifice, which, by the rapid evaporation of the water, are soon raised into cones. The confined water and gases are heard bubbling under ground. Some of these springs deposit pure salt round their orifices, others pure sulphur, and others sulphate of lime or gypsum, which is the most frequent.

The abundant salt supply is a government monopoly. Among the other minerals are copper and argentiferous lead, productive mines of which are worked. Coal of excellent quality occurs in abundance near the shore of the Black Sea, in the vicinity of Ereğli, which represents the ancient *Heraclea*. The field extends from 70 to 80 miles, and belongs to the true carboniferous formation. It was opened and wrought under English direction during the Crimean War for the supply of the steam navy, and is of obvious importance to navigation on the adjoining waters. In the neighbourhood of Konieh the peculiar earth, the meerschaum (literally "sea-foam") of the Germans is quarried, and is locally used like fuller's-earth with ourselves, in addition to its well-known appliance to the manufacture of tobacco-pipes. Loadstones, found near Magnesia ad Sipylum, first received the name of

magnets after that of the town. Jet, the bituminous mineral, was similarly named from a river in the Lycian province, the *Gages*, on the banks of which it was collected by the ancients. It was originally called *gagates*, which passed by successive corruptions into *gagat* and *jet*. The most valuable animal native to the country—the Angora goat—has a limited range on one of the high upland plains, west of the Kizil-Irmak, where the winters are very cold and the summers excessively hot. This climatic contrast is supposed to contribute to the fineness of the hair, made into shawls and camlets, for which the breed is celebrated. The wild boar and hyæna are common; troops of jackals make the night hideous with their cries; and dogs are the scavengers in all the cities, towns, and villages. The camel is the principal beast of burden, and caravans of them are formed in long files for the transport of goods and merchandise. Fruits in vast abundance, wax and honey, drugs and dyes, silk, wool, cotton, leather, and goats' hides are amongst the important commercial products.

The Turks have never been a commercial people. The merchant vessels of Asia Minor are almost wholly manned by Greeks, whilst the Armenians conduct the inland commerce. Smyrna on the south-west coast, and Trebizond near the head of the Black Sea, are the chief commercial cities of note. The former has from time immemorial been a commercial city, and is at this day the chief trading town in the Levant. Its central situation and the excellence of its port have continually attracted merchants of all nations by sea, and caravans by land. Trebizond has also been a commercial city since its foundation by a Greek colony long before the Christian era. No country can be better fitted for commerce than Asia Minor, surrounded as it is by three seas, and abounding in excellent harbours. But industry is paralyzed by an oppressive government; and wealth, if possessed, must be cautiously employed here in the shape of capital, whether in agriculture or manufactures, or in the purchase of a comfortable house or farm, lest it should excite the cupidity of a pasha or his myrmidons. Were due protection given to the fruits of honest industry the commerce of Asia Minor would be ten times more than it is, from the natural fertility of its soil, and its capacity for supporting a dense population.

No general description would convey a correct idea of the climate of Asia Minor, which presents probably more varieties than the peninsula of Spain and Portugal, with which it has been compared as to the extent of surface. The comparison may be carried further. In the numerous chains of lofty mountains which traverse them, in their high plateaus, and in the diversity of climate depending on the configuration of surface, there is a considerable resemblance between the two countries. The climate of both is also materially affected by the adjacent seas. The western shores of Asia Minor, occupied by the Greek colonies, and known by the ancient names of *Æolis* and *Ionia*, have been celebrated in all ages for their genial climate, and for the fertility of their valleys. The summers here, as generally through Asia Minor, are hot, and especially where the local situation does not allow the passage of a free current of air. The high plains of the interior are excessively cold in the winter season. The contrasts between the high regions and the adjacent valleys are such as characterize all countries which have a similar configuration of surface.

The northern shore of Asia Minor being exceedingly humid, parts of the mountain slope, from the edge of the high plains, are covered with magnificent forest trees of various kinds. The forests, stretching west from Boli, the great and almost inexhaustible source of timber supply, contain ash, elm, plane, poplar, larch, beech, and oaks of large size. It is known to the Turks by the significant name of *Agatch Degnia*, or "Sea of Trees," and has a length of 120 miles from west to east, and 40 in breadth.

The coast of the Euxine and the valleys of the northern side of the peninsula are probably the finest part of Asia Minor. On the south the immense mass of Taurus, rising like a wall, and in parts capped with eternal snow, leaves between the Mediterranean and its basis a comparatively narrow slip, and gives to the climate of the southern coast, combined with its geographical position, a character very different from that of the north side of the peninsula. The amount of rain is much less, and the summer heat of the coast is often excessive. Unlike the northern shore, which is well supplied with ever-flowing rivulets, some portions of the Lycian shore, where the mountains press close on the sea, have no water from April to November but what they can keep in reservoirs. The winter torrents cease with the rains. The mountains of Karamania are in general well wooded, and many distant parts are supplied with fuel from them. The timber of this coast, at least that near the shore, is chiefly pine, but not in general of large dimensions. The mountains of Taurus contain a large variety of forest trees and shrubs.

Communications.—The only lines of railway in this great province, which exceeds France in area, are those from Smyrna to Aidin (145 miles), and from Scutari to Ismid (27 miles).

Asia Minor was so well known to the Romans that it was traversed by them in almost every direction. But by far the most important of their roads were the two that led into Syria. There was a well-frequented road likewise by Nicomedia (*Iameed*) to Bagdad, and another led S. near the shore of the Propontis to Smyrna, Ephesus, &c. In all these lines there are ruins, bridges, &c., clearly marking their former existence and consequence. Many of the Roman bridges are in fact still used.

Communications are carried on by four principal roads or routes, only three of which, however, are much used; the fourth almost belongs to history. Their directions are determined by the course of the mountain ranges and valleys. The first route is that which, starting from Trebizond, and passing south-east from Erzeroum and Bayazid, cuts off the north-eastern or Armenian corner of Asia Minor, and communicates directly with Tabreez, Resht, and Teheran. The second is from Samsun to Amasia, Zileh, Tokat, and Sivas, whence it bifurks, the lesser branch going to Kaisarieh, and thence through the narrow pass once known as the Cilician Gates to Tarsus, the greater branch turning eastward, crossing the Anatolian watershed at Delikli Tash, and thence on to Kharpout, in the Euphrates, and to Diarbekir, in the Tigris valley. The direction of this second route is also south-east, and almost parallel to that of the first; but its diagonal intersection takes the province nearer the centre. The third route, not diagonal like the two former, but nearly parallel with the long axis of Asia Minor, starts from the Marinora sea-coast at Ismid, passes by Boli, Tosia, and Osmanjik, and falls in cross-ways with the second route at Amasia.

The fourth route is, like the first and second, diagonal, but instead of cutting off the north-eastern, it cuts off the south-western corner. This is the route by Brousa, Ak-Shahr, and Konieh, thence passing to Tarsus and Syria. But this route is now little frequented.

Political Divisions.—These include six, eyalets or governments, under pashas of varying rank:—

Governments.

Cities and Towns.

Anatolia, . . .	Kutniah, Smyrna, Aidin, Budrun, Brusa, Scutari, Angora.
Rumili or Sivas, . . .	Sivas, Tokat, Amasia, Mersivan, Samsun.
Trebizond, . . .	Trebizond, Kerasun.
Marash, . . .	Marash, Malatiah.
Karamania, . . .	Kaisarieh, Konieh, Karaman.
Adana, . . .	Adana, Tarsus.

In ancient times Asia Minor comprehended nine maritime and five interior provinces, many of which were at intervals distinct states. Their names are therefore introduced as of common occurrence on the page of history.

Ancient Divisions.

Northern. . Bithynia, Paphlagonia, Pontus.
 Western. . Mysia, Lydia or Mæonia, Caria.
 Southern. . Lycia, Pamphylia, Cilicia.
 Central. . Phrygia, Pisidia, Lycaonia, Galatia, Cappadocia.

Anatolia, the largest and most important part of the peninsula, is immediately contiguous to Europe, and has its position in that connection defined by the name, which signifies the "sun rising" or the "east," equivalent to the Levant of the Italians and French. Rich plains extend along the coasts, but a considerable portion of the high central plateau region is embraced, with the western part of the range of Taurus on the south, and of the chain which skirts the shores of the Black Sea on the north. The narrow waters thence to the Archipelago are overlooked by the peaks of the Bithynian Olympus and Mount Ida. The wooded heights of the latter inclose the famous Troad on one side, which the sea, directly south of the Dardanelles, washes on the other. This renowned scene of the struggle commemorated in the *Iliad* is a level peninsular plain, watered by the Menderes and the Bunarbashi, which are supposed to represent the Simois and Scamander of antiquity. Three miles from the shore, a hill called His-sarlik has claims to be considered the true site of Homer's Ilium; and artificial mounds on an adjoining promontory have had the names of Achilles and Patroclus traditionally associated with them as their tombs from a very ancient date. The entire plain has now few noticeable features; and it must have undergone great changes from natural causes in the lapse of ages, as the rivers named, inconsiderable in summer, overspread it with torrent-like floods when swelled by the winter rains. More to the south, in Anatolia, there is a district, the associations of which have a thrilling interest of a widely different kind; for it includes the sites of the "seven churches" of the early Christian period addressed in the *Apocalypse*. Old Smyrna chiefly occupied the slope of Mount Pagus. An excavation on one side of the hill marks the site of the Stadium, and is traditionally regarded as the spot where Polycarp suffered martyrdom in the first age of Christianity. Of all the seven cities which embraced the "seven churches," Smyrna alone has flourished. Of the remaining six, Pergamos, now Bergama, 48 miles on the north; Thyatira, now Ak-Hissar ("White Castle"), 60 miles on the north-east; and Philadelphia, now Allah-Shehr, 85 miles on the east, are inconsiderable places. Sardis, 50 miles on the east, has no representative but the crumbling walls of its Acropolis, and a few mud-built huts; Laodicea, 120 miles on the south-east, has only the poor village of Eski-Hissar ("Old Castle"), by its site; and little appears at Ephesus, 40 miles on the south, but a ruin-strewn malarious plain, abandoned to desolation and silence, except that the rattle of the railway from Smyrna to Aidin, which passes over it, occasionally mingles with the sea bird's cry, the howl of dogs and jackals, and peasant voices from the adjoining hamlet of Aiasaluk.

The pastures of *Rumeli* and *Trebizond* extend along the Black Sea, and have shores possessing great scenic attractions, with a history dating from the days of Grecian fable. Vines and fruit trees clothe the lower slopes of the mountains, above which, up to the summits, are noble beeches and pines. Among the undergrowth is the pale-yellow honey-suckle, on which feed the bees, whose honey had an intoxicating effect, amounting almost to temporary madness, upon the Greeks under the command of Xenophon, described in his history of the "Retreat of the Ten Thousand." This deleterious property, noticed by moderns,

is supposed to be consequent on the bees extracting the honey from the *Azalea Pontica*.

The provinces of *Marash* and *Karamania* are wholly inland, on the eastern side of the peninsula. That of *Adgna* is maritime, and forms the extreme north-eastern coast of the Mediterranean, indented by the Gulf of Iskenderun. It coincides with ancient Cilicia, and is chiefly a fertile plain, separated from the interior table-lands by the range of Taurus, which is crossed by the pass of Golek-Boghaz, the old Cilician Gates.

Population.—Asia Minor is mostly inhabited by Greeks and Turks. The former are more numerous in the western part than in the east, and they form a considerable portion of the population of all the commercial towns, and several districts in the western part are exclusively inhabited by them. All those who call themselves Turks are not of Turkish origin, and there are several hundred thousand so-called Turks who are descended from Greek ancestors.

Ethnically speaking, Asia Minor is at present the true home of the Turks. It is one of the mainstays of the Ottoman empire, from which this power continues to draw most of the resources that have hitherto enabled it to preserve its footing in Europe. Hence it is that the true character of this race can best be studied in Anatolia. All the western provinces are inhabited chiefly by Turks, who, however, even here are compelled to maintain the struggle for existence with other nationalities, and especially with the Hellenes. Further east other races, such as the Armenians, Kurds, and Lazis, take part in the rivalry.

Yet, strange to say, the term "Turk" itself, at one time a proud title from the shores of the Adriatic to the remotest confines of Central Asia, is now carefully eschewed even in Anatolia, where it has become a byword of reproach, answering somewhat to the English "boor," or "clodhopper." And the people themselves have become all the more sensitive on the point, inasmuch as the "effendi" or refined "gentleman" from Stamboul regards the terms "Turk" and "Anatolian" as practically synonymous with "uncouth" or "clownish." The stalwart and sinewy figure of the Anatolian peasant, his rough manners, his harsh dialect—so different in its primitive type from the Arabo-Persian jargon that passes for Turkish in the capital—combined with his rude pronunciation, which has been compared to the gobbling of an enraged turkey-cock, affords a constant source of merriment to the dandies from the other side of the Bosphorus.

At the same time the social condition of the people must be regarded as backward and unsatisfactory. Since the days of the Trojan War the cultivation of the land has undergone but little improvement, and even the simple art of maintaining meadow lands is still unknown, so that during the dry summer months the herds must still be driven to the uplands in quest of a sorry pasturage. The fig, the vine, and the olive supply the Turkish peasant with his frugal fare, and enable him to meet his scanty wants. What need, therefore, to trouble himself with refined systems of husbandry?

The Turkish village presents a far from inviting appearance. The uncleanly hovels, built of adobe or sun-baked bricks, and pierced with one or two holes for windows, usually comprise two compartments—one for the family, the other for the storage of provisions. The fittings of the interior are extremely simple—the furniture consisting mainly of a straw mat on the floor, a trestle bed with woollen mattress and cotton coverlets in the corner, a rude chest for the linen and best clothes, a few copper vessels and stone water jars.

Dr. Carl Scherzer, a shrewd observer and a competent judge in Oriental matters, paints the present and the future of the Anatolian Turk in a few pregnant touches:—"The Turk, as a rule, understands his own language only,

whereas all the other races in the country speak at least two from their infancy. This is due partly from his pride and contempt for all non-Mohammedan peoples, partly to the lack of enterprise and social rivalry. Earnest, reserved, and perhaps somewhat indolent, the Turk is still gifted with a fair share of intelligence. But though a keen observer of character he lacks the business habits and the calculating spirit which have enabled the rival races to monopolize nearly all the trade of the country. In the rural districts the Turks are occupied mainly with agriculture and stock-breeding; in the towns they either deal in the local products or else ply such simple trades as suffice to supply the few wants of their existence. Under proper management they make good seamen, and are also well suited for the caravan trade. They are, generally speaking, honourable in all their dealings, frank, kind-hearted, and hospitable; while in religious matters they are, contrary to the general impression, the most tolerant of all Oriental races. They are deficient in the qualities of industry, perseverance in the acquisition of wealth, and the upward tendency towards social improvement; and indolence may be regarded as one of their most salient national failings. The morrow troubles them but little; hence they will often pay an exorbitant interest for the means wherewith to tide over temporary embarrassments, and will freely sell their lands without giving a thought to the consequent decrease of future income.

In the districts where they are surrounded by Greek and Armenian communities the Turks have fallen greatly behind, but, thanks to the natural resources of the land and their own frugal lives, they are seldom reduced to absolute want."

The exclusion of the female element from the social life of the Turk helps but to intensify the evil. The continuance of this practice is due mainly to the low state of education, which completely fails to meet the requirements of modern ideas.

It is not perhaps surprising that under such circumstances the energetic, mercurial, and quick-witted Greek should threaten to usurp the inheritance of the Turk even during his lifetime. Occupied with thoughts of gain, a shrewd, calculating man of business, a skilful seafarer and intelligent husbandman, the Greek outrivals his Moslem neighbour in every pursuit of life. The learned professions he almost entirely monopolizes, and the doctor, lawyer, teacher, banker, are everywhere sure to be of Hellenic blood. The Greek is invariably the broker who negotiates all business matters for "his Turkish friend," and he has secured the almost exclusive control over the local and export trade. The Armenian is intellectually scarcely his inferior, and in festless energy fully his equal.

Other ethnical elements in Asia Minor are the Jews, numerous in the large towns, the Gipsies, the Circassians, Abkhassians, Lazis, and the Yuruks, a nomad Turki race occupying the uplands between Erzeroum and the plains of North Syria. Mention should also be made of the Kizil-Bashis, or "Red-heads," a remarkable race, also of Turki stock, scattered over Anatolia, Persia, and Afghanistan as far east as Cabul. Outwardly devout Mohammedans, the Kizil-Bashis are none the less tenaciously attached to their own peculiar tenets and observances. These they never reveal to strangers, and Mordtmann, who frequently visited Asia Minor, never succeeded in obtaining any trustworthy information regarding them. He, however, agrees with Van Lennep in looking on them as the last survivors of the old pagan communities. But Mr. W. Gifford Palgrave, when British consul at Trebizond in 1868, described them as "a sort of Eastern Mormonites, with a dash of Persian or Shiah superstition." He adds that they are as distinct from the Osmanli as the Saxons are from the Swedes. They call themselves "Eski-Turk"—that is, "Old Turks"

—a term often applied to the Anatolian Turkoman tribes, to whom they seem to be closely akin in physique and speech. Although reputed atheists, they are said to be believers in the doctrine of transmigration, are very hospitable, and entirely free from the absurd feelings of jealousy which degrade women to the level of the brute creation in most Mohammedan countries. The fertile plains of Kaz Ova and Ard Ova, near Tokat, and the villages between Angora and Amasia, and between Kara-Hissar and Tokat, are the central quarters of the Anatolian Red-heads.

The Circassians and Abkhassians, who migrated to Turkey after the reduction of West Caucasia by the Russians, have never found suitable homes in Asia Minor, where they have consequently become a serious disturbing element. Mrs. Scott-Stevenson and other recent travellers represent them as a source of constant trouble, hopelessly indolent, given to plundering and hectoring over the people, levying blackmail right and left, and actually laying siege to the provincial towns.

Turkomana, a branch of the same family as the Ottomans, who speak a kindred dialect, but retain the nomadic usages of their ancestors, are numerous on the high plains, where they live in tents during the summer, frequently shifting their camps in search of pasturage, and generally spend the winter in fixed villages. They possess large herds of camels, buffaloes, goats, and sheep, and breed horses for sale; while the women spin wool, make carpets and articles of clothing. Each camp is under the government of a chief, and pays a tax to the pashas of the respective districts proportioned to the number of tents, for the privilege of pasturing their flocks and herds. While adhering to Mohammedanism, they have little acquaintance with its dogmas and precepts, and have no mosques or priests. The Turkomans are variously spread further east, over the high grounds of Armenia, the wavy downs of Upper Mesopotamia, and the northern plains of the Syrian desert. In the middle and eastern parts there is a considerable number of Kurds, who are either permanently settled or wander with their herds to the western table-lands, and sometimes, though seldom, as far as Brusa.

Previous to the treaty of Berlin in 1878 the area of Asia Minor, the whole of which was under Turkish rule, was estimated at 660,870 square miles, and the population at 16,050,000. As the fruits of her victories in the war of 1877-78, Russia claimed a very large tract of territory adjoining her Transcaucasian provinces. At the Congress of Berlin, however, she consented to waive some portion of her claim, and ultimately obtained an accession of 12,000 square miles, containing 350,000 inhabitants. Cyprus, an island of 4200 square miles and 150,000 inhabitants, generally regarded as belonging to Asia Minor, was by the Anglo-Turkish Convention placed under the administration of Great Britain.

The general condition of Asia Minor and its population under Turkish rule could not be much worse than it is. Manufacturing industry is almost entirely stifled, and every branch of agriculture is at a low ebb. Under the present lords of the soil there is no security for property, and but scanty remuneration for agricultural toil. It is quite common for a pasha, should a plentiful harvest be expected, to seize the standing crops at a low valuation, and then have them put up to the highest bidder. The mode of farming the revenue is also most paralyzing to all industry, and especially destructive to the main dependence of the people—that of agriculture. A person who wishes to farm the revenues of a district, suppose of ten or twelve villages, after ascertaining their value, makes an offer for them for a term of years. As the government is always indigent, an offer of ready money is generally accepted; and nothing more is required to give the *milletzem* unlimited power over the district in question, and full

authority to augment his revenue by every means of fraud and extortion, than the appointment of the pasha. The sultan is the viceroy of the Prophet, and the pasha is the image of the sultan, and every soldier who carries an order is the representative of the pasha. Every pasha unites in his own person the civil and military powers, and joins with these very frequently the farming of the revenue, and some of them exercise judicial power; so that every pasha, in his own province, may be denominated a sultan on a small scale. This principle of successive delegation multiplies indefinitely the number of oppressors under whose misrule and rapacity the commercial and agricultural resources of the country are dried up. Whole cities which formerly subsisted and flourished, some by one and some by another special branch of manufacture, now lie ruined and desolate. Nothing but huts are to be seen in the places of farm-houses, stables, barns, and granaries; while the lands are constantly reverting to the state, and are let by the pashas to any one who will undertake their cultivation. Thus by far the greater portion of the land lies waste for want of cultivation, and what might be a paradise is reduced to a desert. The implements and processes of husbandry are not a step advanced beyond those of 2000 years ago. The plough, which is frequently not even shod with iron, is drawn by oxen. The grain is thrashed, or more frequently trodden, by an indefinite number of horses or oxen placed abreast of each other, and driven in a circle, and advantage is taken of the first windy day to winnow it. In ancient Phrygia little is to be seen but the vestiges of dilapidated cities, towns, and villages. Even the fertile plain of Konieh is uncultivated, except in the neighbourhood of some widely dispersed villages. It may be remarked, however, that wherever the pashas have been able to maintain their independence for any length of time, such districts are invariably the richest, best peopled, and cultivated, since these chiefs find it their interest to encourage the cultivators of the land, who are continually deserting those parts of the country governed by the immediate officers of the sultan, to place themselves under their protection. The prosperity of Asia Minor in this way fluctuates according to the actions and dispositions of its respective rulers; sometimes districts are well-peopled and cultivated for years in succession, at other times they are waste and forsaken; and this state of things will be better understood when it is remarked that whole villages emigrate from one district to another without much trouble or expense, since their houses are simple and of easy construction, and their articles of furniture so few and trifling as to be easily

transported on the backs of the cattle, which supply them with milk during the journey, and find everywhere abundance of pasture.

History.—The term *Asia Minor* is one of comparatively recent date. It was unknown to Greek and Roman geographers, at least under the early emperors. The word *Anatolia* originated under the Greek empire, and referred to the country which lay east of the seat of government.

Asia Minor was known to the later Greeks under various divisions. Mysia, Lydia, and Caria occupied the western shores; Lycia, Pamphylia with Pisidia, and Cilicia, to which Lycaonia was sometimes added, bounded it to the south; and on the north coast were Bithynia, Paphlagonia, and Pontus. The elevated plains of the interior presented to the east Cappadocia, extending over the mountains to the borders of the Euphrates; and Phrygia on the west, bounded towards the sea by Mysia, Lydia, and Caria. Parts of Phrygia and Cappadocia afterwards became Galatia. The Greeks established colonies and built towns on all the three coasts of the peninsula, but their occupation was most complete and continuous on the west side. Here we find, lying from N. to S., the districts of Æolis, Ionia, and the little Dorian confederation in the S.W. angle of Caria. Herodotus speaks of thirty different nations or tribes which inhabited Asia Minor in his time. Many of these figure conspicuously in the history of Greece and her colonies. The country remained in part under Persian dominion for two centuries before Alexander's time. After Alexander's death Asia Minor formed part of one of the kingdoms into which his vast empire was divided. When the Romans afterwards seized it, they divided it into Asia within Taurus and Asia beyond Taurus.

Under the Roman dominion the peninsula attained the most uniform and settled state, and no doubt also the most prosperous condition that it has ever yet enjoyed. The decline of that power, and the feeble sway of the eastern empire, laid open the country to new invasion from the east, and the Mohammedans began to establish themselves in some of the eastern parts of the peninsula, about A.D. 700. When the first crusaders, under Peter the Hermit, landed near Nicæa, in 1096, they found the Turks in possession of this part of Asia, and separated from the capital of Alexis only by the waters of the Propontis and the Bosphorus.

Under the Anglo-Turkish Convention of 4th June, 1878, England was pledged to assist the sultan in defending his Asiatic territory against any further aggression of Russia—the Porte in turn pledging itself to introduce various reforms into its Asiatic dominions.

END OF VOL. I.

